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ABSTRACT

Science and Engineering Education data and information are presented in six chapters, each chapter containing detailed statistical charts and tables. Resources data contained in chapter 1 are grouped into four categories: K-12, higher education, funding, and informal education. Resources may take the form of capital, personnel, and teaching materials and may be expressed in types of educational programs offered, curricula used, and amount of time spent on them. Chapter 2 presents data on how many and what kinds of people participate in science, mathematics, and technology education and what form that participation takes. Chapter 3 focuses on student, faculty, and public attitudes, goals, and needs concerning science and mathematics education. Test data are examined in chapter 4. Degree data in chapter 5 are grouped into three categories: total number of earned degrees by subject and level, percent distribution of earned degrees by subject and level, and degree and distribution data for women and minorities. Science/engineering employment data (focusing on employment and salaries) are presented in chapter 6. Each chapter begins with an introduction and highlights of the data presented therein. (Author/JN)

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Science and Engineering Education: Data and Information

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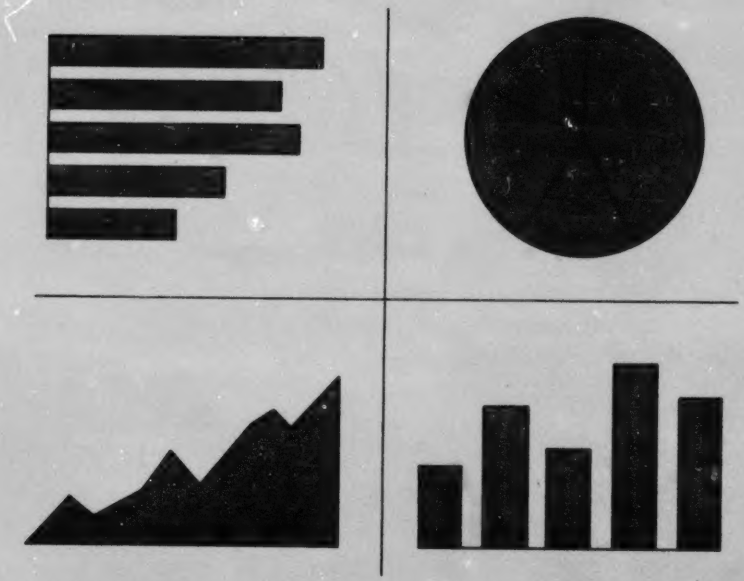

PREPARED FOR THE NATIONAL SCIENCE BOARD
COMMISSION ON PRECOLLEGE EDUCATION
IN MATHEMATICS, SCIENCE AND TECHNOLOGY

BY THE
OFFICE OF SCIENTIFIC & ENGINEERING
PERSONNEL & EDUCATION

NATIONAL SCIENCE FOUNDATION

Prepared by

Alphonse Buccino
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Acknowledgement

This report is largely based upon, and updates, the "Science Education Databook" (SE 80-3). The revisions and new information have been added in an attempt to provide the most current information and data about the state of science and engineering education in the U.S.

In the various tasks of gathering, formulating and evaluating data for this report, the Office appreciates the assistance of many individuals. In particular we thank Lida Barrett, Jerry Bellon, Robert Boldt, Mary Boyden, John Bradley, Garrett Briggs, William Coffield, Elmer Collins, Larry Conaway, Thomas Cooney, Sharon Crumpton, Douglas DePriest, Charleen DeRidder, Charles Dickens, Marie D. Eldridge, James Gates, Kevin Gilmartin, Evelyne M. Graham, Vance Grant, Lawrence Haaby, Charles Hucka, Maury Hurt, Carlos Kruytbosch, Wayne Martin, Jean McCauley, Stafford Metz, Jay Noell, Robert Parke, Ronald Pedone, Don Ploch, Len Ramist, Robert J. Rossi, Jack Scopino, Lee Shulman, George Springer, Tong Soo Song, Marilyn Suydam, Peter Syverson, Michael Templeton, Paul Terwilliger, Harry Tunis, Betty Vetter, Alfred Willcox and Robert Wright.

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Paul Evans was responsible for overall manuscript review and the final editing of this document.

Introduction

See samples 57-67
and 115 (?)

Although there is general agreement that science and technology are critical to the welfare and future of the United States, and there is also agreement that the quality of precollege education in these fields is a matter for serious concern, there remain a great many questions regarding the priorities, urgency and potential for improvement. Questions have been raised regarding such issues as the quality and supply of teachers, comparisons with other technological societies, dependence on foreign talent, science understanding among decision makers and the general public, insufficient instructional equipment, the lack of programs for the gifted and talented, and opportunities and motivation for women and minorities.

The need to establish a national consensus and plan for action is the reason that the National Science Board has asked for an eminent Commission to examine the problems. The Board and the National Science Foundation hope that this Commission will be able to weigh and balance the evidence and issues and arrive at recommendations for priorities and actions that can guide educational planners and decision makers.

To aid the process, we have assembled this compendium of information and data regarding resources, participation, achievement, attitudes and employment in science and engineering at all educational levels. Although not offered as a definitive collection, we have tried to make it as broad and comprehensive as possible, so that it can form a "baseline" of facts about the status of science and engineering education at this time. We have organized the material in areas of general interest, and have preceded each area by a brief discussion that summarizes the salient facts and information about the area. Generally, entries consist of charts, and/or tables, accompanied by brief explanatory remarks and an indication of the source for the material.

Much of the material in this report is based upon the "Science Education Databook" published in 1980, which has been updated and supplemented to provide as current and authoritative information as possible. Additional data and interpretive information can be found in the original sources, as noted.

Walter L. Gillespie
Director
Office of Scientific and Engineering
Personnel and Education

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Chapter I
RESOURCES

INTRODUCTION

Resources may be provided by personnel acting as teachers, or by institutions offering courses of instruction, or by society making tax dollars available to support colleges and museums. Resources may take the form of capital, personnel, and teaching materials and may also be expressed in the types of educational programs offered, the curricula used, and the amount of time spent on them.

The resources data contained in this chapter are grouped into four categories: K-12, higher education, funding, and informal education.

HIGHLIGHTS

K-12

1. The fraction of all secondary teachers spending the largest portion of their time in science, mathematics, or social studies increased by almost 22% from 1961 to 1976. (Chart I-1).
2. State supervisors from most states feel that there are shortages of teachers in mathematics, physics, chemistry and earth science (Tables I-4 A & B).
3. The supply of individuals with new degrees in mathematics and science education has been falling since 1972 (Table I-5).
4. Slightly more than half of all grade 10-12 science teachers were using one or more of the Federally funded science curriculum materials during the 1976-1977 school year. (Chart I-7).
5. Students in K-3 spend an average of less than 20 minutes a day on science. (Chart I-8)
6. Approximately 90% of the grade 7-12 science classes make use of the metric system. (Chart I-9)
7. Relatively few schools have separate budgets for scientific equipment and supplies. (Chart I-10)
8. Over one-third of K-6 classrooms have no science facilities. (Chart I-11)
9. There has been an increase in the proportion of students participating in individualized instruction and computer aided instruction. (Chart I-13)

Higher Education

1. Between 1969 and 1975 the number of mathematical and physical sciences faculty, as a percentage of total college teaching faculty, decreased by 50%. (Chart I-14)
2. Between 1969 and 1975, the number of biological science faculty, as a percentage of total teaching faculty, increased by 50%. (Chart I-14)
3. Since 1965, the full time faculty in higher education has increased by 89% and the part-time faculty by 76%; however, the student faculty ratio has also increased. (Table I-14A)
4. Faculty in computer science university departments (+25%) and in private college mathematics departments (+16%) have increased since 1975. (Table I-14B)
5. The number of teaching assistants doubled from 1975 to 1980 in computer science and private college mathematics departments. (Table I-14C)
6. 10% of all engineering faculty positions were unfilled as of September 1980. (Table I-16)
7. The greatest number of engineering faculty moves were in the field of computer engineering. (Table I-17)
8. Nearly 25% of all junior faculty teaching engineering in the U.S. received their baccalaureate outside the U.S. (Table I-18)
9. Engineering faculty salaries show a mean range of $34,500 for full professors to $20,000 for assistant professors. (Table I-19)
10. The percent of public and private college faculty holding doctorates declined (74% to 69% and 69% to 64%) during the five-year period. (Chart I-17)
11. The number of women on mathematical science faculties has increased from 10% to 14%, with median age for women faculty about five years less than that for men. (Chart I-18)
12. For mathematics in two-year colleges, part-time faculty now outnumber full-time faculty. (Chart I-19)
13. It is not likely that the educational qualifications of part-time mathematics faculty will increase in the near future. (Chart I-20)
14. The percent of higher educations with access to computers doubled between 1969 and 1977. (Chart I-21)

Funding

1. The average amount requested for instructional scientific equipment shows a continual rise between 1976 and 1981. (Chart I-22)
2. NSF has shifted support over time among students, faculty, institutions, and R&D. (Chart I-23)
3. In regard to levels of education NSF has also shifted priorities over time. (Chart I-24)

Continuing and Informal Education

1. During 1975-76 there were almost 3500 degree credit courses in continuing education for scientists and engineers. There were about 4900 non-credit activities in continuing education. (Charts I-25-26)
2. In 1979, museums received less than one-fourth of their total operating income from private sources, such as foundations, corporations, individual contributions, and other sources. Art museums received the greatest relative percentage of their total operating income from private sources (25 percent) and parks and visitor centers the least (6 percent). On the whole, museums received approximately the same financial support (4 percent of total operating income) from each of foundations, individuals, and other sources. Financial support from corporations made up only an estimated 2 percent of total operating income. (Table I-26)
3. Museums with higher operating income were more likely to have increasing educational roles. Conversely, those institutions with the lowest operating incomes were more likely to indicate that their educational roles were staying the same. (Table I-27)
4. An estimated 66 percent of all museums offered some type of specific program in fiscal year 1979. Children's museums (83 percent) and art and science museums (78 percent) were more likely to have specific programs than other types of museums. (Chart I-27)
5. Approximately one-fourth of the museums offered teacher training periodically or on a regular basis on how to use museum resources. An estimated 65 percent of the children's museums offered teacher training. Around 40 percent of science museums and art museums offered such training; only 16 percent of the specialized museums offered some type of teacher training. (Chart I-29)
6. Between 1972 and 1978, science and technology centers and museums received slightly over $30 million in Federal funds. (Chart I-30)

Chart I-1: Public secondary school teachers, by subject taught, spring 1961 to spring 1976

The fraction of all secondary teachers spending the largest portion of their time in teaching science, mathematics, or social studies increased by almost 22% from 1961 to 1976.

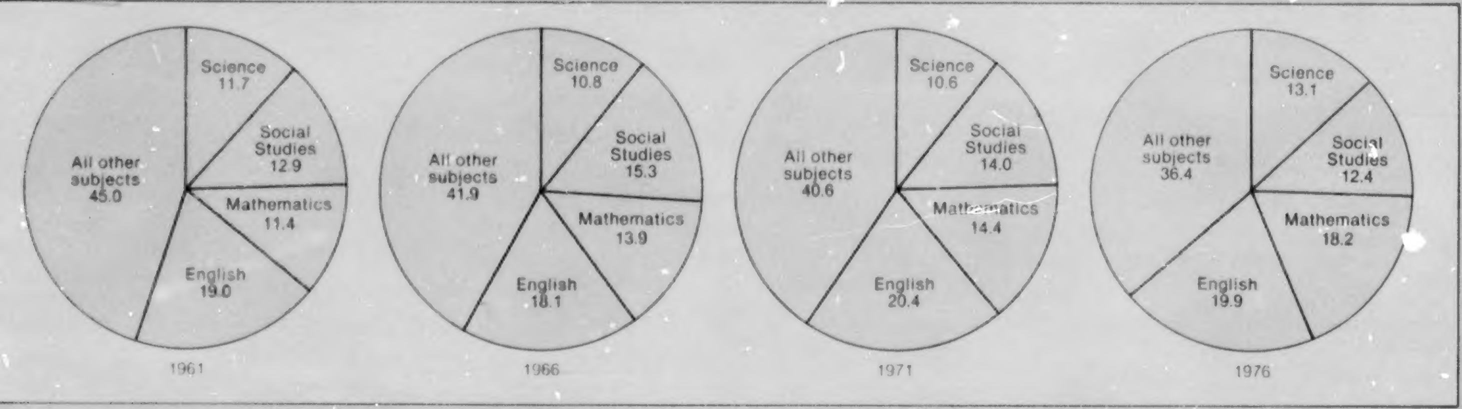


Table I-1: Public secondary school teachers, by subject taught, spring 1961 to spring 1976

(Percentage distribution)

Teaching field in which largest[1] portion of time was spent	1961[2]	1966	1971	1976
1	2	3	4	5
All fields	**100.0**	**100.0**	**100.0**	**100.0**
Agriculture	2.6	1.6	0.6	0.6
Art	2.2	2.0	3.7	2.4
Business education	7.6	7.0	5.9	4.6
English	19.0	18.1	20.4	19.9
Foreign language	4.1	6.4	4.8	4.2
Health and physical education	8.2	6.9	8.3	7.9
Home economics	5.1	5.9	5.1	2.8
Industrial arts	5.5	5.1	6.2	3.9
Mathematics	11.4	13.9	14.4	18.2
Music	1.7	4.7	3.8	3.0
Science	11.7	10.8	10.6	13.1
Social studies	12.9	15.3	14.0	12.4
Special education	0.3	0.4	1.1	3.0
Other	1.0	1.9	1.0	4.0

[1] Half-time or more

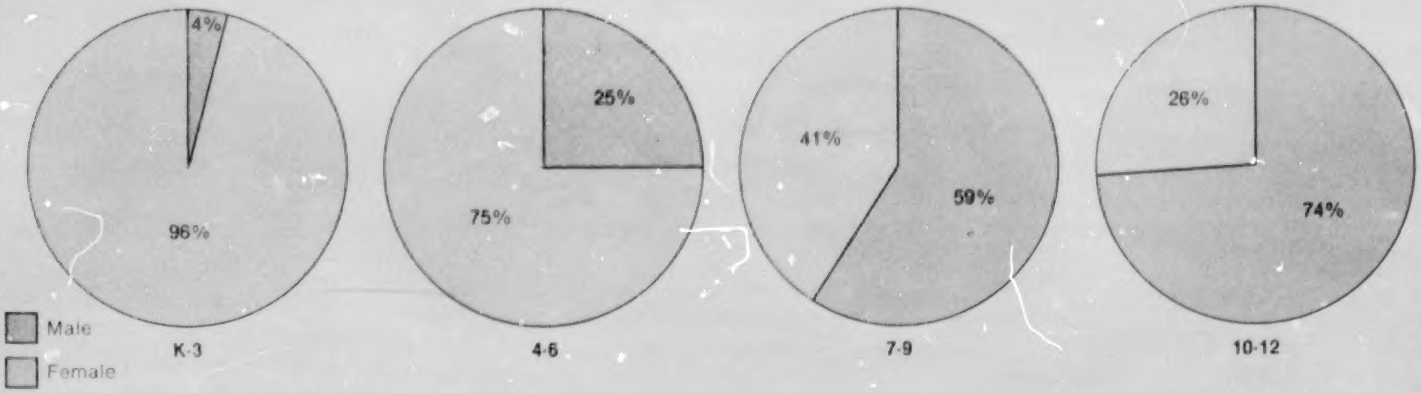
[2] Data add to 93.3 percent. The remaining 6.7 percent reported teaching two or more subjects (each half time or less).

NOTE: Data are based upon sample surveys of public school teachers. Because of rounding, percents may not add to 100.0.

Source: National Education Association, *Status of the American Public School Teacher, 1975-76*. (Copyright © 1977 by the National Education Association. All rights reserved.) Reprinted from Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1977-78*, p. 53.

Chart I-2: Percent of male and female science, mathematics, and social studies teachers, by grade range

Most elementary school teachers are women. They usually teach science, mathematics, and socia studies as well as other subjects. Most high school teachers of mathematics, science, and socia studies are men and they usually teach within one subject field.



ource: Weiss, Iris R., *et al. The Status of Pre-College Science, Mathematics, and Social Studies Education Practices in U.S. Schools: An Overview and Summaries of Three Studies,* Highlights Report, p. 11.

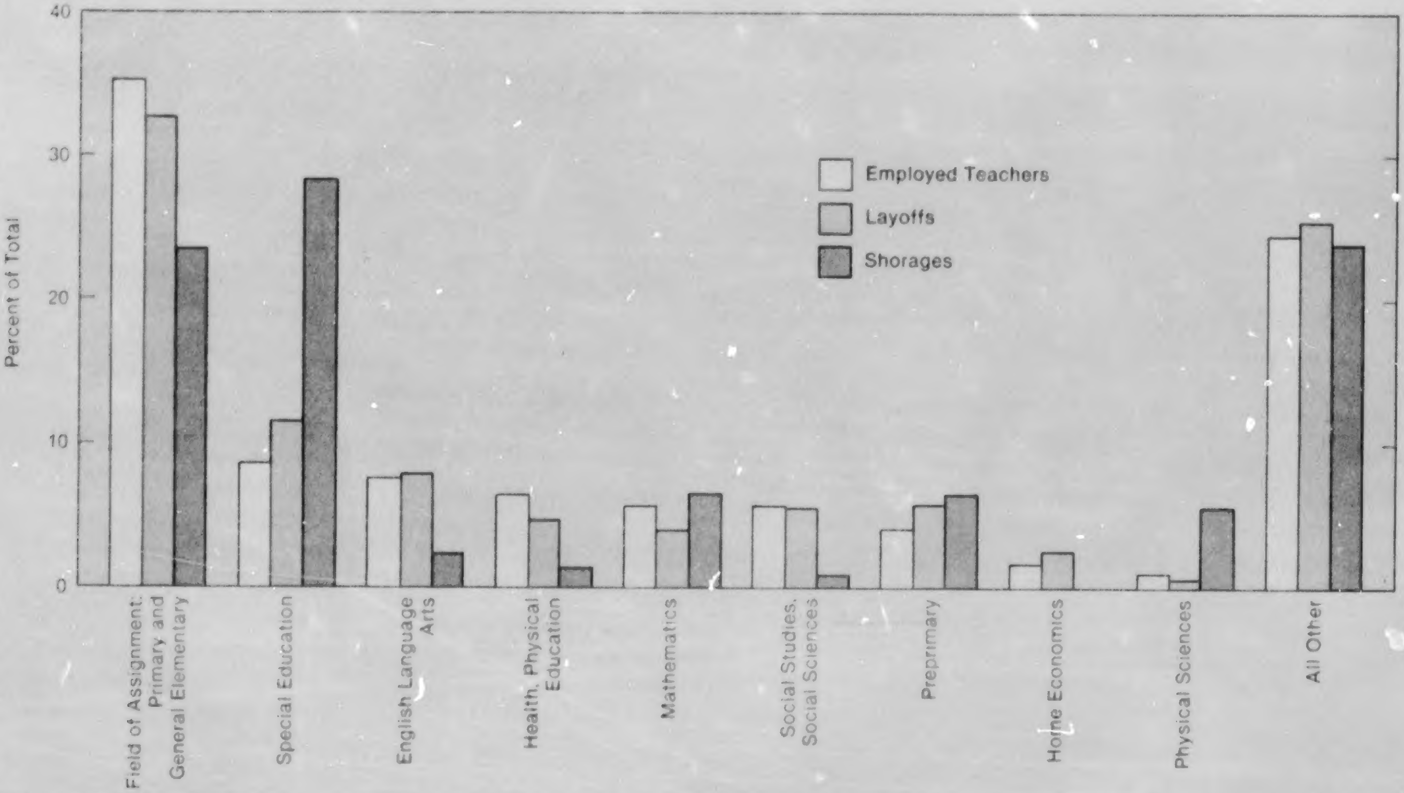
Table I-2: Percent of male and female teachers of science, mathematics, and social studies, by grade range

	Mathematics			*Science*			*Social Studies*			*Total*		
Grade Range	Male	Female	Unknown	Male	Female	Unknown	Male	Female	Unknown	Male	Female	Unknown
K-3 (N = 838)	6	94	0	2	98	0	3	96	1	4	96	0
4-6 (N = 829)	21	76	2	33	67	0	19	79	1	25	74	1
7-9 (N = 1538)	54	46	0	62	38	0	62	38	0	59	41	0
10-12 (N = 1624)	68	32	0	74	24	2	75	24	1	73	26	1
Sample N		1672			1679			1478			4829	

ource: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education,* p. 141

Chart I-3: Employed teachers and teacher layoffs and shortages by field as percent of total employed teachers and teacher layoffs and shortages

While 23 percent of teacher shortages were in elementary education, an even larger proportion layoffs were in that field in 1979. Fields in which the number of shortages exceeded the number layoffs were bilingual education, industrial arts, physical sciences, and special education.



urce: The Condition of Education, NCES, 1982, p. 101

Table I-3: Employed teachers and teacher layoffs and shortages in public and private elementary/secondary schools, by field of assignment: spring 1979

	Employed Teachers[1]		Layoffs[2]		Shortages[3]	
Field of Assignment	Number[4]	Percent of All Teachers	Number	Percent of All Layoffs	Number	Percent of All Shortages
Total	2,552,000	100.0	23,900	100.0	11,300	100.0
Preprimary	99,000	3.9	1,300	5.5	700	6.3
Primary and General Elementary	899,000	35.2	7,800	32.8	2,600	23.3
Art	57,000	2.2	1,100	4.5	100	.8
Basic Skills and Remedial Education	9,000	.3	100	.5	([5])	([5])
Bilingual Education	22,000	.9	200	1.0	400	3.7
Biology	30,000	1.2	300	1.1	100	.9
Business	45,000	1.8	400	1.7	200	1.8
English Language Arts	188,000	7.4	1,800	7.6	200	2.2
Foreign Languages	53,000	2.1	800	3.3	100	1.1
General Science	76,000	3.0	700	3.0	200	2.1
Health, Physical Education	158,000	6.2	1,100	4.7	100	1.2
Home Economics	36,000	1.4	500	2.3	([5])	([5])
Industrial Arts	41,000	1.6	400	1.8	600	5.3
Mathematics	150,000	5.9	1,100	4.4	900	8.3
Music	87,000	3.4	900	3.7	200	1.4
Reading	73,000	2.9	400	1.5	300	2.8
Physical Sciences	25,000	1.0	100	.5	600	5.5
Social Studies/Social Sciences	143,000	5.6	1,300	5.5	100	.8
Special Education	219,000	8.6	2,700	11.5	3,200	28.3
Vocational Education	101,000	4.0	600	2.5	300	2.9
Other	39,000	1.5	100	.4	100	1.1

[1] Includes all full-time and part-time classroom teachers in public and private elementary/secondary schools during the 1979-80 school year.

[2] A layoff represents a teacher whose contract was not renewed at the end of the 1978-79 school year because of budget limitations, and whose position was not subsequently filled.

[3] A shortage represents a teaching position opening (budgeted new position or position vacancy) occurring from spring 1979 to fall 1979 (for the 1979-80 school year) for which teachers were sought but were unable to be hired because no qualified candidate was available.

[4] These figures represent unduplicated counts of teachers among fields. Teachers in more than one field were reported only in the field in which they spent most of their teaching time. The exception was that any teacher engaged in bilingual or special education was counted in either of those areas regardless of the time spent in other areas.

[5] Less than 100 positions.

Note: Details may not add to totals because of rounding.

Source: U.S. Department of Education, National Center for Education Statistics, Survey of Teacher Demand and Shortages, "Teacher Layoffs, Shortages in 1979 Small Compared with Total Employed," NCES 81-121a, 1981.

Table I-4 A: Estimated supply of secondary biology, chemistry, physics, general science, earth science and mathematics teachers by state, 1980-81

	Biology		Chemistry		Physics		General Science		Earth Science		Math	
State	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Alabama	2	2	3	3.5	5	5	3	3	4	4	NR	4
Alaska	1	2	1	2	1	2	1	2	1	2	1	2
Arizona	NR	3	NR	4	NR	5	NR	5	NR	3	NR	4
Arkansas	3	3	4	4	4	4	3	3	3	3	4	4
California	2	3	2	4	4	4	3	3	4	4	2	4
Colorado	3	3	3.5	4	3.5	4	3.5	4	3.5	4	3.5	4
Connecticut	3	3	3	4	4	5	3	4	3	4	4	5
Delaware	3	1	3	3	3	4	3	1	3	1	3	4
District of Columbia	3	3	3	3	4	4	2	3	3	3	4	5
Florida	3	3	5	5	5	5	4	4	5	5	4	4
Georgia	1	2.5	1	3.5	1	4	1	5	1	4	1	5
Hawaii	2	3	4	4	4	5	3	3	4	4	3	4
Idaho	1	1	4	4	4	4	3	3	4	3	4	4
Illinois	3	3	5	5	5	5	4	4	4	4	5	5
Indiana	5	5	5	5	5	5	5	5	5	5	5	5
Iowa	2	2	5	4	5	5	3	3	4	4	5	5
Kansas	2	3	4	4	4	4	4	3	4	3	4	5
Kentucky	3	3	4	4	5	5	3	3	4	4	5	5
Louisiana	3	3	4	4	5	5	3	3	4	4	4	4
Maine	3	3	3.5	5	3.5	5	3.5	3	3.5	3	4	4
Maryland	3	2	4	4	4	4	4	4	4	4	4	5
Massachusetts	1	NR	1	NR	1	NR	1	NR	1	NR	1	NR
Michigan	3	NR	4	NR	4	NR	3	NR	3	NR	4	NR
Minnesota	2	2	3	3	4	4	3	3	3	3	NR	4
Mississippi	1	1	2	2	4	4	1	1	4	4	NR	3
Missouri	4	4	5	5	5	5	4	4	4	4	5	5
Montana	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nebraska	3	3	4	4	4	4	3	3	4	3	3	4
Nevada	3	3	4	4	5	5	3	3	3	3	4	4
New Hampshire	2	3	5	5	5	5	4	4	5	5	5	5
New Jersey	3	NR	3.5	NR	4	NR	3	NR	3	NR	3	NR
New Mexico	2	NR	3	NR	4	NR	2	NR	3	NR	4	NR
New York	3	3	4	4	5	5	3	3	4	4	5	5
North Carolina	4	2	5	4	5	5	4	3	4	5	5	5
North Dakota	3	3	4	4	4	4	4	NR	4	4	4	4
Ohio	2	3	4	4	5	5	3	3	2	3	3	3
Oklahoma	2	3	4	4	5	5	2	2	5	5	5	4
Oregon	3	2	3	4	3	5	3	3	3	4	5	4
Pennsylvania	2	1	4	4	5	5	2	1	4	5	5	5
Rhode Island	NR	3	NR	3	NR	3	NR	3	NR	3	NR	4
South Carolina	4	4	5	5	5	5	4	3	5	5	5	5
South Dakota	3	3.5	4	4	5	5	3	3.5	3	3.5	3	5
Tennessee	3	2.5	3.5	4	3.5	4	3	2	4	4	3.5	4
Texas	2	1	3	3	3	3	4	5	5	5	5	5
Utah	3	3	4	4	4	4	3	3	4	4	4	5
Vermont	4	4	4	5	5	5	3	4	3	4	3	4
Virginia	1	1	3	4	4	3	2	1	5	4	4	4
Washington	3	NR	4	NR	4	NR	3	NR	4	NR	3.5	NR
West Virginia	3	3	5	4	5	5	4	4	4	4	5	4
Wisconsin	2	3	4	4	5	5	4	3	4	4	5	4
Wyoming	3	3	4	3	4	3	3	2	4	3	4	4
American Samoa	5	4	5	5	5	5	5	5	5	5	5	4
Puerto Rico	NR	2	NR	4	NR	5	NR	2	NR	5	NR	3

Table I-4 B: Estimated supply of secondary science and mathematics teachers: 1980 and 1981

State supervisors from most states feel that there are shortages of teachers in mathematics, physics, chemistry and earth science. The perceived shortages became more extreme between the 1980 and 1981 surveys.

Summary of State-by-State Responses

	Biology		Chemistry		Physics		General Science		Earth Science		Math	
Response	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
1	6	6	3	0	3	0	4	4	3	1	3	0
2	13	10	2	2	0	1	5	5	1	1	1	1
3	24	26	13	8	6	4	27	23	14	13	10	3
4	4	4	21	28	19	15	11	9	23	22	16	25
5	2	1	10	9	21	27	2	5	8	10	16	18
NR	4	6	4	6	4	6	4	7	4	6	7	6

Responses: 1 = Surplus; 2 = Slight Surplus; 3 = Adequate Supply; 4 = Shortage; 5 = Critical Shortage; NR = No Response.

Source: Trever G. Howe and Jack A. Gerlovich, *National Study of the Estimated Supply and Demand of Secondary Science and Mathematics Teachers*. November 1981.

Table I-5: Supply of individuals with mathematics education and science education degrees granted: 1971-72 to 1979-80

The supply of individuals with new degrees in mathematics and science education has been falling since 1972 although total degrees granted in all fields have risen. The decline in numbers has been greater for men than for women.

A. Bachelors Degrees Requiring 4 or 5 Years

	Total All Fields	Mathematics Education			Science Education		
		Total	Male	Female	Total	Male	Female
1971-72	887,273	2,425	1,144	1,281	1,064	577	487
1973-74	945,776	2,037	921	1,116	941	542	399
1975-76	934,443	1,442	594	848	792	451	341
1977-78	921,204	1,048	439	609	755	416	339
1979-80	929,417	762	310	452	672	309	363

B. Masters Degrees

	Total, All Fields	Mathematics Education			Science Education		
		Total	Male	Female	Total	Male	Female
1971-72	251,633	764	413	351	758	446	312
1973-74	277,033	828	447	381	904	604	300
1975-76	313,001	746	335	411	737	421	316
1977-78	311,620	598	230	368	775	406	369
1979-80	298,081	512	211	301	591	328	263

Source: Digest of Education Statistics (various editions), NCES

Chart I-4: Most frequently used social studies textbooks/programs by grade range[1]

Textbook/Program	Percent of K-3 Classes
Laidlaw Social Science Program (King)	14
Social Sciences: Concepts and Values (Brandwein)	9
Concepts & Inquiry Series	5
Our Working World (Senesh)	3
Investigating Man's World Program	3
Silver Burdett Social Science (Anderson)	3
Focus on Active Learning: Social Studies	3
Contemporary Social Science Curriculum (Anderson)	2
Holt Databank System for Elementary Social Studies. (Fielder)	2
Map & Globe Skills (Nasaland)	2

Textbook/Program	Percent of 4-6 Classes
Exploring Series	14
Social Sciences: Concepts and Values (Brandwein)	13
Laidlaw Social Science Program (King)	10
Contemporary Social Science Curriculum (Anderson)	7
Man and His World Series	5
Concepts & Inquiry Series	4
Tiegs-Adams Series	4
Field Social Studies Program	3
Holt Databank System for Elementary Social Studies (Fielder)	3
Focus on Active Learning: Social Studies	2
Silver Burdett Social Science (Anderson)	2

Textbook/Program	Percent of 7-9 Classes
This is America's Story (Wilder)	5
The Free and the Brave (Graff)	4
America: Its Peoples and Values (Wood)	3
Liberty and Union: A History of the U.S. (Ridge)	3
Quest for Liberty (Chapin)	3
Challenge & Change (Eibling)	2
American Civics (Hartley)	2
Foundations of Freedom (Eibling)	2

Textbook/Program	Percent of 10-12 Classes
Rise of the American Nation (Todd)	7
Magruder's American Government (McClenaghan)	5
Economics: Principles and Practices (Brown)	4
Carnegie-Mellon Social Studies Curriculum Project—Holt Social Studies (Fenton)	3
History of a Free People (Bragdon)	3
Sociology: The Study of Human Relationships (Thomas)	3
American History (Abramowitz)	2
Concepts in American History (Morzello)	2
Medieval and Early Modern Times (Hayes)	2
Men and Nations: A World History (Mazour)	2
Modern History (Becker)	2

[1] Teachers were given a list of titles and asked 1) to select the ones their sample class used, and 2) to further select *the one* "used most often." These data represent the responses to the second question. Teachers were able, as well, to report titles not on the list. Where a book has more than one author, only the first one listed is used. Programs include a variety of combinations: frequently a book with manipulative materials, or tapes, or individually paced card sets, etc.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, pp. B 46-47.

Chart I-5: Most frequently used science textbooks/programs by grade range[1]

Textbook/Program	Percent of K-3 Classes
Concepts in Science (Brandwein)	12
Science: Understanding Your Environment (Mallinson)	5
New Laidlaw Science Program (Smith)	5
Heath Science Series (Schneider)	4
Science Curriculum Improvement Study (SCIS): Life Science	4
Modern Elementary Science (Fischler)	4
Science: A Process Approach (SAPA)	2
Science Curriculum Improvement Study (SCIS): Physical Science	2
Modular Activities Program in Science (Berger)	2
Kindergarten Keys (Economy)	2

Textbook/Program	Percent of 4-6 Classes
Concepts in Science (Brandwein)	16
Science: Understanding Your Environment (Mallinson)	10
New Laidlaw Science Program (Smith)	7
Today's Basic Science Series (Navarra)	7
Elementary Science: Learning by Investigating (ESLI)	5
Heath Science Series (Schneider)	5
Steck-Vaughn Elementary Science Series (Ware)	4
Introductory Physical Science (Haber-Schaim)	3
Science: A Process Approach (SAPA)	3
Science Curriculum Improvement Study (SCIS): Life Science	3
Investigating In Science (Jacobson)	2
Science Curriculum Improvement Study (SCIS): Physical Science	2

Textbook/Program	Percent of 7-9 Classes
Focus on Earth Science (Bishop)	8
Intermediate Science Curriculum Study: Probing the Natural World	7
Principals of Science Series (Heimler)	6
Introductory Physical Science (IPS) (Haber-Schaim)	4
Living Things (Fitzpatrick)	3
Study Lessons in General Science (Gross)	3
Focus on Life Science (Heimler)	3
Modern Science Series (Blanc)	3
Life: Its Forms and Changes	3
Modern Biology (Otto)	2
Modern Earth Science (Ramsey)	2
Life in the Environment (Navarra)	2
Interaction of Man and the Biosphere: Inquiry in Life Science (Abraham)	2

	Percent of 10-12 Classes
Modern Biology (Otto)	12
Modern Chemistry (Metcalfe)	7
Biological Science: An Ecological Approach (BSCS Green)	6
Biological Science: An Inquiry Into Life (BSCS Yellow) (Moore)	4
Biology: Introduction to Life (Nason)	3
Biology: Living Systems (Oram)	3
College Physics (Schaum)	3
Modern Physics (Williams)	3
Biology (Kroeber)	2
Biological Science: Molecules to Man (BSCS Blue)	2
Biology (Smallwood)	2
The Project Physics (Rutherford)	2
Modern Physical Science (Tracy)	2

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[1] Teachers were given a list of titles and asked 1) to select the ones their sample class used, and 2) to further select *the one* "used most often." These data represent the responses to the second question. Teachers were able as well to report titles not on the list. Where a book has more than one author, only the first one listed is used. Programs include a variety of combinations: frequently a book with manipulative materials, or tapes, or individually paced card sets, etc.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, pp. B-44-45.

Chart I-6: Most frequently used mathematics textbooks/programs by grade range[1]

Textbook/Program	Percent of K-3 Classes
Holt School Mathematics (Nichols)	18
Mathematics Around Us: Skills and Applications (Bolster)	13
Modern School Mathematics: Structure and Use (Duncan)	8
Elementary School Mathematics (Eicholz)	8
The Understanding Mathematics Program (Gundlach)	8[2]
Investigating School Mathematics (Eicholz)	5
Exploring Elementary Mathematics (Keedy)	4
Heath Elementary Mathematics Program (Dilley)	3
Mathematics for Individual Achievement (Denholm)	2
Laidlaw Mathematics Series (McSwain)	2
Silver Burdett Mathematics System (LeBlanc)	2
Using Numbers (Gundlach)	2

	Percent of 4-6 Classes
Holt School Mathematics (Nichols)	19
Modern School Mathematics: Structure and Use (Duncan)	10
Mathematics Around Us: Skills and Applications (Bolster)	9
Investigating School Mathematics (Eicholz)	9
Elementary School Mathematics (Eicholz)	8
Exploring Elementary Mathematics (Keedy)	5
Laidlaw Mathematics Series (McSwain)	4
Mathematics for Individual Achievement (Denholm)	4
Silver Burdett Mathematics System (LeBlanc)	4
Heath Elementary Mathematics Program (Dilley)	3
Unifying Math (Deans)	3

Textbook/Program	Percent of 7-9 Classes
Holt School Mathematics (Nichols)	7
Modern Algebra: Structure and Method (Dolciani)	7
Exploring Modern Mathematics (Keedy)	6
Modern School Mathematics: Structure and Method (Dolciani)	6
Modern Mathematics Through Discovery (Morton)	5
School Mathematics (Eicholz)	4
Mathematics Around Us: Skills and Applications (Bolster)	4
Elementary Algebra (Denholm)	3
The Understanding Mathematics Program (Gundlach)	3
Refresher Mathematics (Stein)	2
Fundamentals of Mathematics (Stein)	2
Modern School Mathematics: Pre-Algebra (Dolciani)	2
Modern School Mathematics: Structure and Use (Duncan)	2

	Percent of 10-12 Classes
Modern Algebra and Trigonometry: Structure and Method (Dolciani)	13
Modern School Mathematics: Geometry (Jurgensen)	12
Modern Algebra: Structure and Method (Dolciani)	4
Geometry (Jurgensen)	3
Geometry (Morgan)	3
Modern Introductory Analysis (Dolciani)	3
Algebra II with Trigonometry (Smart)	2
Holt Algebra II with Trigonometry	2

---

[1] Teachers were given a list of titles and asked 1) to select the ones their sample class used and 2) to further select *the one* "used most often." These data represent the responses to the second question. Teachers were able as well to report titles not on the list. Where a book has more than one author, only the first one listed is used. Program includes a variety of combinations, frequently a book with manipulative materials, or tapes, or individually paced card sets, etc.

[2] This percent includes the percent of use for *Using Numbers* (Gundlach) which is a part of the program.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, pp. B-42-43.

Chart I-7: Percent of teachers using Federally funded curriculum materials in each subject by grade range[1]

Use of Federally funded curricula tends to increase with increasing grade level. Slightly more than half of all grade 10-12 science teachers were using one or more of the Federally funded science curriculum materials during the 1976-77 school year.

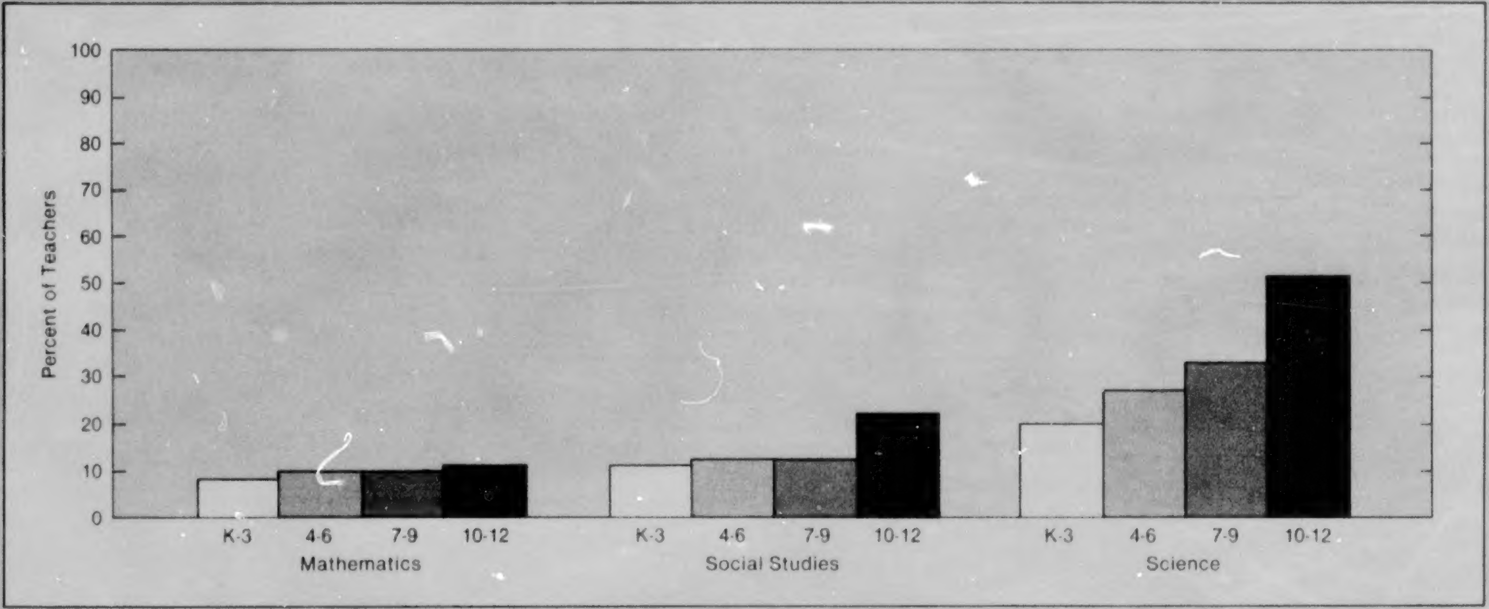


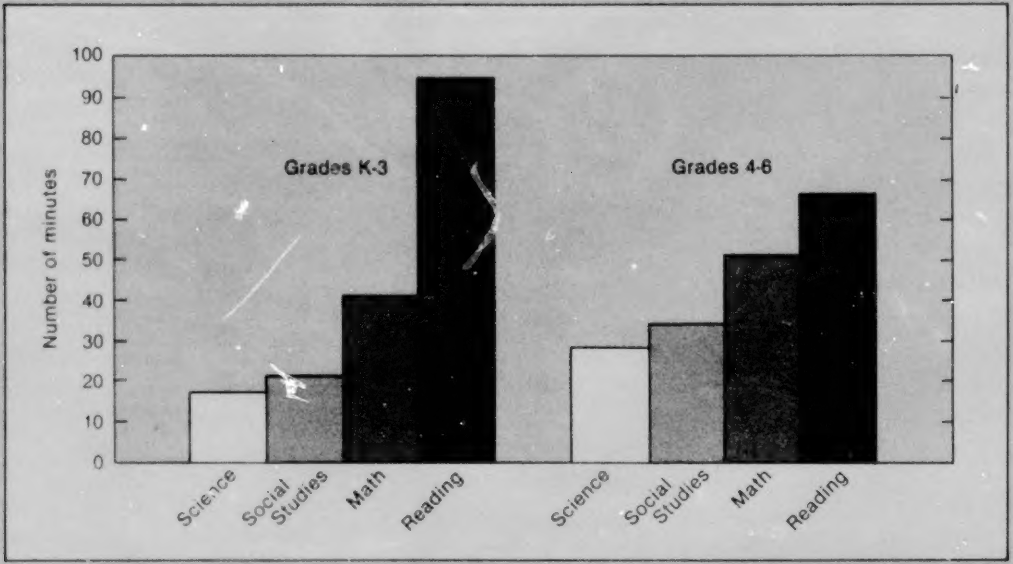
Table I-7: Percent of teachers using Federally funded curriculum materials in each subject by grade range

	Subject									Total		
	Mathematics			Social Studies			Science					
Grade Range	Yes	No	Unknown/ Inconsistent	Yes	No	Unknown/ Inconsistent	Yes	No	Unknown/ Inconsistent	Yes	No	Unknown/ Inconsistent
K-3 (N = 838)	8	80	12	11	80	10	20	69	11	13	76	11
4-6 (N = 829)	10	80	11	12	75	13	27	61	12	16	72	12
7-9 (N = 1538)	10	84	6	12	84	4	33	61	6	18	77	5
10-12 (N = 1624)	11	86	3	22	73	5	52	44	5	28	68	4
Sample N	1672			1478			1979			4829		

[1] Teachers were given a list of textbooks/programs the development of which had been federally financed, and asked to indicate 1) general familiarity and use, and 2) which, if any, they were using during 1976-77 ("using" could mean that the textbook/program was being used exclusively or as one of many). These data represent responses to the second question.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 83.

Chart I-8: Average number of minutes per day spent teaching each subject in self-contained classes, by grade range[1]



Students in Grades K-3 spend an average of about 20 minutes each day on science and on social studies. The difference between the amount of time spent on reading and that spent on other subjects decreases from K-3 to 4-6.

Table I-8: Average number of minutes per day spent teaching each subject in self-contained classes, by grade range[1]

	Grade Range					
	K-3		*4-6*		*Total*	
Subject	Average Number of Minutes	Standard Error	Average Number of Minutes	Standard Error	Average Number of Minutes	Standard Error
Mathematics	41	.61	51	.43	44	.38
Science	17	.24	28	.64	20	.28
Social Studies	21	.62	34	.71	25	.53
Reading	95	1.60	66	1.34	86	1.18
Sample N	467		302		769	

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[1] Teachers self-reported these data.

NOTE: Only teachers who indicated they teach mathematics, science, social studies, and reading to one class of students were included in these analyses.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 51.

Chart I-9: Percent of mathematics and science classes that use metric concepts by subject and grade range.

The use of metric concepts increases with increasing grade level in science classes; approximately 90% of the 7-9 and 10-12 science classes make use of the metric system.

In mathematics classes, use is higher in the lower grades; by grades 10-12 only 56% of mathematics classes use metric concepts.

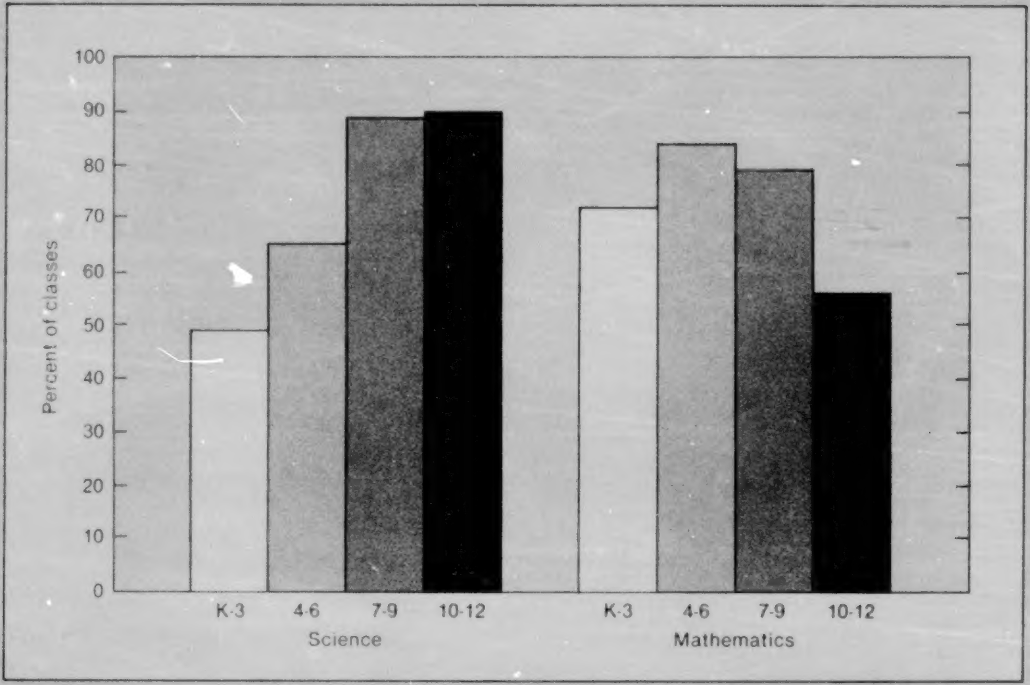


Table I-9: Percent of mathematics and science classes that treat metric concepts in each of a number of ways, by subject and grade range

	Mathematics					Science				
Use of Metric Concepts	K-3	4-6	7-9	10-12	Total	K-3	4-6	7-9	10-12	Total
Not Used	26	13	20	43	24	42	31	10	7	26
Special Metric Unit Only	42	43	34	7	35	22	19	13	8	17
Used Special Metric Unit and Used Throughout Course	8	22	22	5	15	13	20	40	44	27
Introduced as Needed	22	19	23	44	25	14	26	36	38	26
Missing	2	3	1	1	2	9	4	1	3	5
Sample N	297	277	550	548	1672	287	271	535	586	1679

Source: Weiss, Iris R. *Report of the 1977 Survey of Science, Mathematics, and Social Studies Education*, p. 119

Chart I-10: Percent of schools with specific budgets for science equipment and science supplies, and average amounts of these budgets per pupil, by grade range

Relatively few schools have specific budgets for science equipment and supplies. In general, schools are somewhat more likely to have specific budgets for supplies than for equipment, and secondary schools are much more likely than elementary schools to have specific budgets for both. The per pupil amounts of science budgets for secondary schools are considerably larger than those for elementary schools, but to the extent the middle schools have such budgets at all, they are not much smaller than those in grades 10-12.

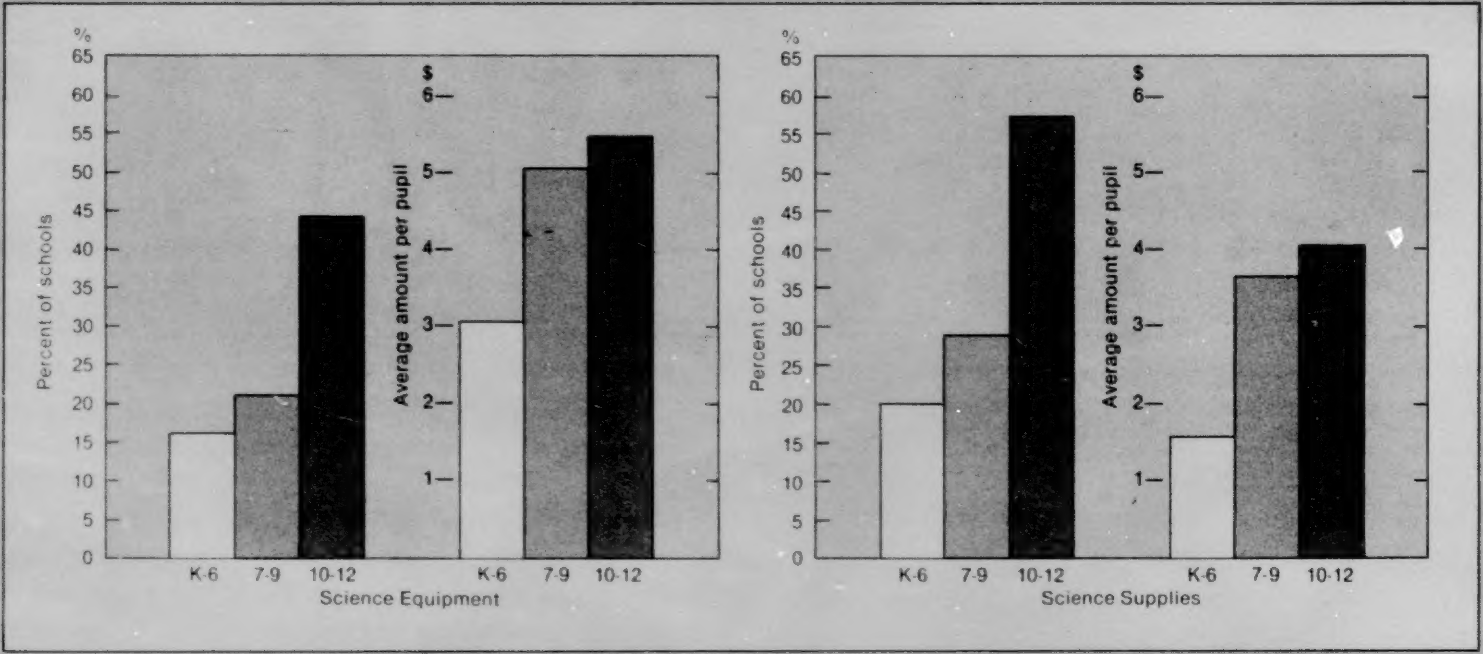


Table I-10: Percent of schools with specific budgets for science equipment and science supplies, and average amounts of these budgets per pupil by sample grade range[1]

	Science Equipment				Science Supplies			
Sample Grade Range	Sample N	Percent of Schools	Average Budget Amount	Standard Error	Sample N	Percent of Schools	Average Budget Amount	Standard Error
K-6	107	16	$3.05	$ .31	155	20	$1.56	$ .15
7-9	119	21	$5.03	$2.09	176	29	$3.62	$1.25
10-12	117	44	$5.46	$ .84	180	57	$4.02	$ .65

[1] Schools that reported there was a specific budget but did not indicate the amount, and schools that did not indicate total enrollment were not included in the calculations of average amounts per pupil.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 126.

Chart I-11: Percent of elementary science classes conducted in various types of rooms

Slightly more than half of all elementary school classes receive science instruction in classrooms with portable science materials. Only 4% of the elementary science classes (and virtually all of these are grades 4-6) are conducted in laboratories or special science rooms. More than a third of the classes are conducted in classrooms with no science facilities at all.

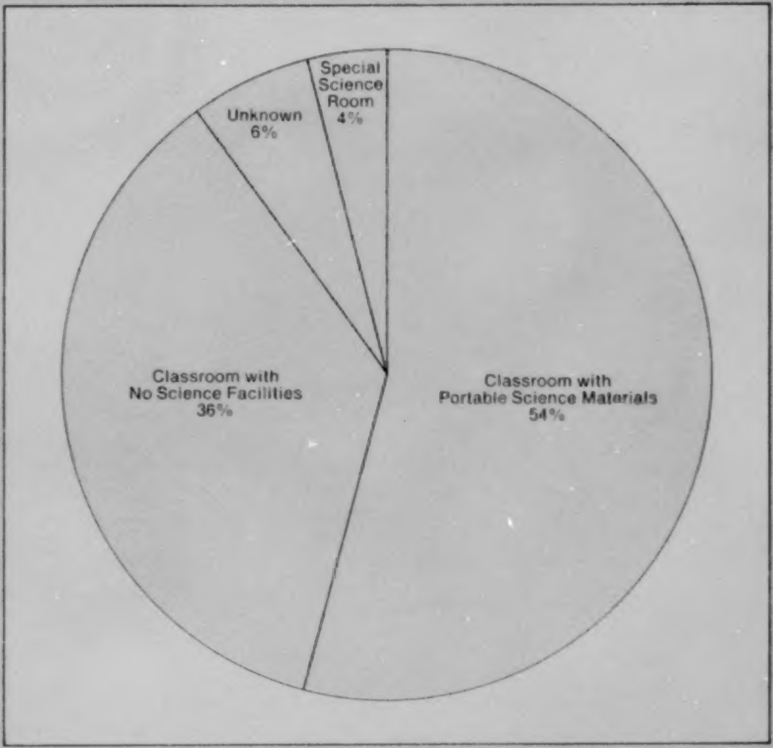


Table I-11: Percent of elementary science classes conducted in various types of rooms, by grade range

	Grade Range		
Type of Room	K-3	4-6	Total
Laboratory or special science room	0	9	4
Classroom with portable science materials	54	54	54
Classroom with no science facilities	38	34	36
Unknown	8	3	6
Sample N	287	271	558

urce: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 129.

Chart I-12: Percent of schools with various kinds of equipment, by grade range, 1977

With a few minor exceptions, the availability of science equipment is directly related to grade level with the higher grades getting more equipment. Microscopes and models are the most frequently encountered equipment.

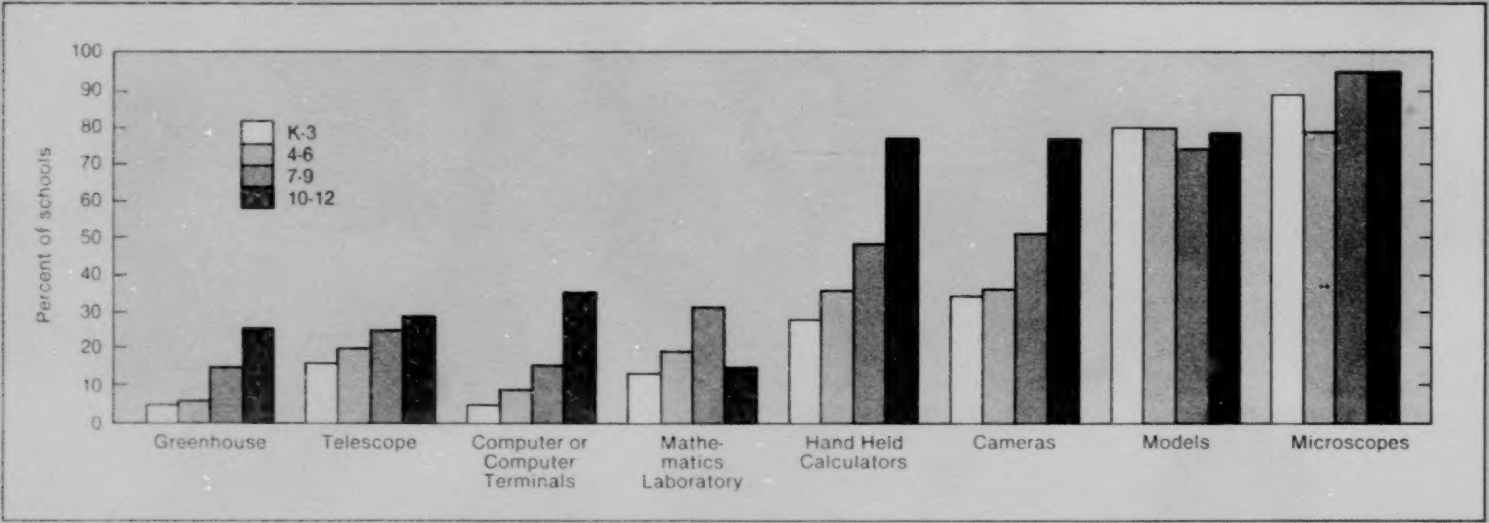


Table I-12A: Percent of schools with various kinds of equipment, by sample grade range, 1977

Equipment	Sample Grade Range			
	K-3	4-6	7-9	10-12
Computer or Computer Terminals	5	9	16	36
Greenhouse	5	6	15	26
Telescope	16	20	25	29
Darkroom	11	16	37	75
Weather Station	7	10	14	22
Hand-held Calculators	28	36	49	77
Microscopes	89	79	95	95
Cameras	34	36	51	81
Models (e.g., of the solar system, parts of organisms, etc.)	80	80	74	79
Small Group Meeting Rooms	48	40	56	59
Resource Center for Individualized Instruction	45	45	51	44
Mathematics Laboratory	13	19	31	15
Sample N	317	292	298	270

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 127.

Table I-12 B: Public school districts providing students access to at least one computer for educational purposes: United States, 1980

(Table entries are school districts providing access.)

	Type of School, by Grade Level				
Type of access	Total (at least one level) (1)	Elementary Level (2)	Secondary Level (3)	Combined Elem/ Sec Schools and Special Schools (4)	More Than One Level (5)
At least one microcomputer or one terminal	7,606	2,196	6,616	678	1,884
			(in percents of column 1)		
At least one microcomputer or one terminal	7,606	29	87	9	25
At least one microcomputer ..	6,631	29	84	9	22
At least one terminal	2,973	21	99	5	25
At least one microcomputer *and* one terminal	1,998	17	95	3	15

Column 1 represents the unduplicated number of districts providing access to computers at any level. Since some districts make computers available at more than one type of school, the percents in columns 2-4 include duplicated counts of districts. The difference between the total duplicated counts (col. 2-4) and the unduplicated count (col. 1) represents the percent of districts providing computer access at more than one level (col. 5).

Source: "Fast Response Survey System" NCES U.S. Dept. of Education. 3/20/81

Table I-13: Teaching methods used in courses taken by high school seniors, by control of school: 1972 and 1980

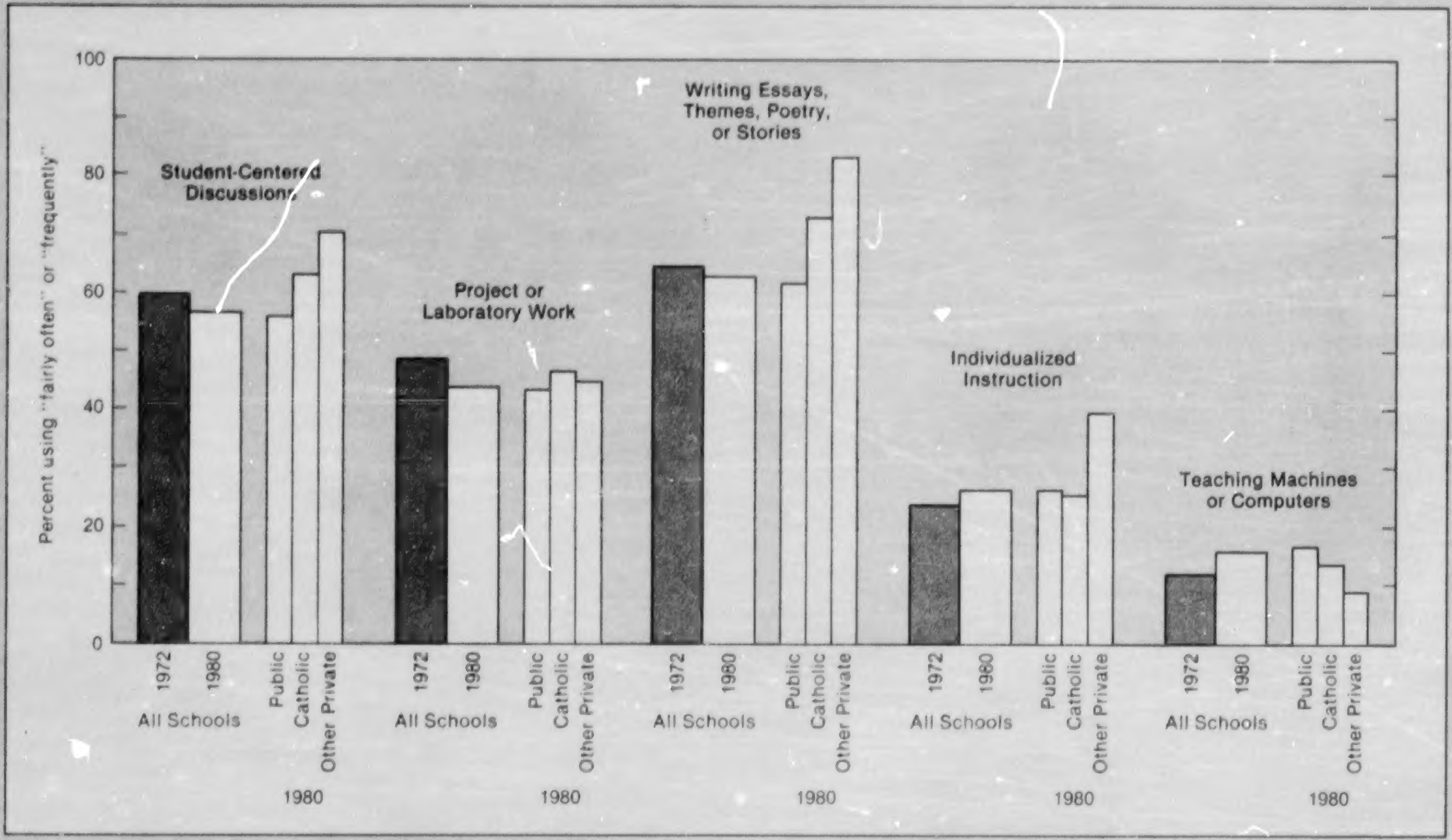
Teaching Method	All Schools	Public Schools	Catholic Schools	Other Private Schools[1]
	Percent of Seniors Responding "Fairly Often" or "Frequently" Used in Courses			
1972 Seniors:				
Student-centered Discussions	59.8	59.3	72.0	65.2
Project or Laboratory Work	48.4	48.0	52.5	42.3
Writing Essays, Themes, Poetry or Stories	64.5	63.9	68.9	88.5
Individualized Instruction	23.9	23.3	31.0	16.8
Teaching Machines or Computer-assisted Instruction	12.1	12.0	13.0	5.0
1980 Seniors:				
Student-centered Discussions	56.7	55.8	63.0	70.2
Project or Laboratory Work	43.6	43.4	46.7	45.0
Writing Essays, Themes, Poetry or Stories	62.9	61.3	73.0	83.7
Individualized Instruction	26.6	26.2	25.4	39.7
Teaching Machines or Computer-assisted Instruction	16.0	16.4	13.8	8.9

[1] Because of the small school sample size, the heterogeneity of the schools, and the high non-response rate for schools in this sector, the estimates for other private schools are not nearly as accurate or as interpretable as those for public or Catholic schools.

Source: U.S. Department of Education, National Center for Education Statistics, National Longitudinal Study and High School and Beyond Survey, unpublished tabulations.

Chart I-13: Teaching methods used in courses taken by high school seniors

Between 1972 and 1980, there was an increase in the proportion of students participating in classes where individualized instruction and teaching machines or computer-assisted instruction were likely to be used.



Source: The Condition of Education, NCES, 1982, p. 83.

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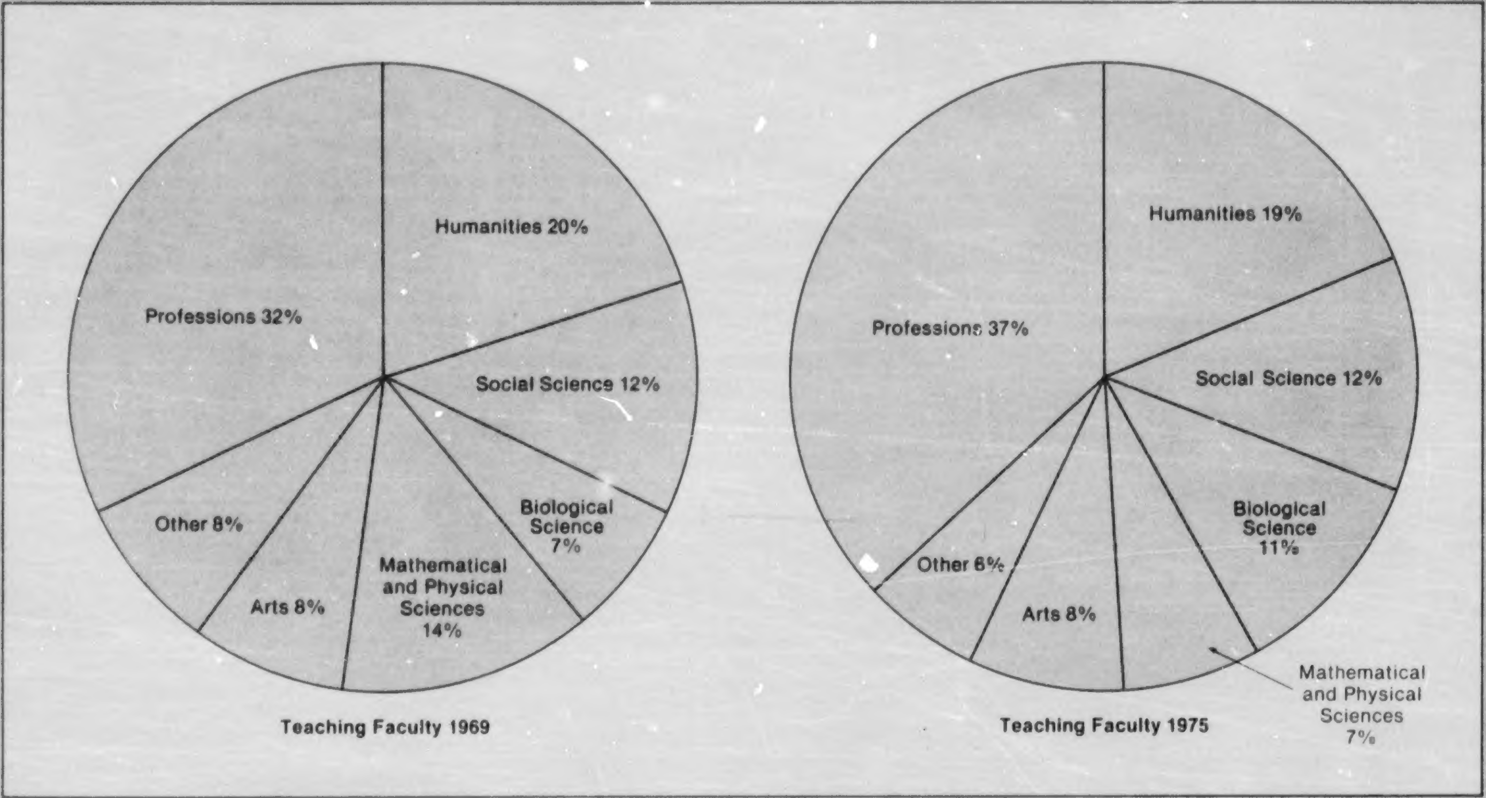
40

Chart I-14: Percentages of teaching faculty in higher education in subject fields 1969 and 1975

The biological, mathematical and physical sciences underwent major faculty shifts during the first half of the 1970s. As a percentage of total faculty, the mathematical and physical sciences' share decreased by 50% while the biological sciences' share increased by a like amount. The professions showed a 16% gain while the remaining subjects held steady. These shifts are consistent with shifts in undergraduate enrollments during this time period.



Source: Carnegie Foundation for the Advancement of Teaching, *Missions of the College Curriculum*, p. 103. (revised with permission of author.)

Table I-14 A: Faculty in all higher education, 1965-1980

Since 1965, the full-time faculty in higher education has increased by 89% and the part-time faculty by 76%. However, the student faculty ratio has also increased in the same time period. The growth in two-year college faculty has been at a much greater rate than in four-year institutions.

Faculty in Thousands

	1965	1970	1975	1980*
Four-year Institutions				
FTE Faculty	NA	322	360	372
FTE Students/FTE Faculty**	NA	16.1	16.4	16.9
All Higher Education				
Full-Time Faculty	248	369	430	468
Part-Time Faculty	92	104	142	162
FTE Students/Fte Faculty	16.8	16.6	17.4	18.2

*Projected

**FTE equals full-time plus one third of part-time

Source: *Projections of Education Statistics to 1985-86.*

Table I-14 B: Faculty in mathematics, statistics, and computer science, 1980

From 1975 to 1980 the largest faculty increase occurred in private college mathematics departments (+832 FTE). Faculty in departments of computer science also increased to a number about 9% of all FTE mathematical science faculty. These two types of departments also experienced the greatest course enrollment increases.

	1970		1975		1980	
Type of Department	Full	Part	Full	Part	Full	Part
Universities						
Mathematics	6,235	615	5,405	699	5,605	1,038
Statistics	700	93	732	68	610	132
Computer Science	688	300	987	133	1,236	365
Public Colleges						
Mathematics	6,068	876	6,160	1,339	6,264	2,319
Computer Science	NA		NA		436	361
Private Colleges	3,352	945	3,579	1,359	4,153	2,099
Total	17,043	2,829	16,863	3,598	18,304	6,314

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Table I-14 C: Mathematical science teaching assistants in universities and four-year colleges

The number of teaching assistants doubled from 1975 to 1980 in computer science and private college mathematics departments, while use of TA's declined in statistics and public college mathematics departments. Over 20% of all TA's are not graduate students, up from only 6% in 1975. In university mathematics departments an even greater fraction are not mathematics graduate students.

Type of Institution	1970	1975	1980
Universities			
Mathematics	5,999	5,087	5,491
Computer Science	309	835	1,813
Statistics	747	690	546
Public Colleges			
Mathematics	1,804	1,805	1,535
Computer Science	NA	NA	90
Private Colleges	146	559	1,154
Total	9,005	8,976	10,629

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Table I-14 D: Age distribution of full-time mathematics faculty by sex and by educational level, 1980

From 1975 to 1980 the women on full-time mathematics faculties of two-year colleges increased from 21% to 25% of the total. As might be expected, women are more heavily represented in younger age ranges, with nearly one-third less than 35 years of age.

Faculty in the 35-44 year range are more likely to hold doctorates than the other age groups, with 52% of all doctorates held by faculty in that age group.

	Sex		Highest Degree	
Age Range	Male	Female	Doctorate	Master's
< 35	16%	31%	17%	18%
35-44	45%	35%	52%	43%
45-54	27%	24%	19%	27%
≥ 55	12%	10%	12%	12%

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Table I-15: Trends in distribution of recent doctoral faculty[1] by field and year

Field	Recent Doctoral Faculty as % of Total Doctoral Faculty				% of Recent Doctorates Desired by Dept. Heads[2]
	1968	1974	1978	1980	
Biochemistry	31	21	17	14	25
Biology	36	26	23	20	27
Botany	—	25	17	21	25
Chemical Engineering	40	22	21	24	29
Chemistry	35	21	17	16	27
Economics	43	38	34	32	32
Electrical Engineering	52	31	20	19	29
Geology	—	26	23	20	28
Mathematics	52	37	27	23	26
Microbiology	31	28	24	18	28
Physics	40	18	13	11	22
Physiology	34	30	27	23	25
Psychology	44	38	32	27	34
Sociology	47	45	36	32	33
Zoology	—	29	26	25	32

[1] Faculty who have held doctorates seven years or less.

[2] Median value of responses from 1980 survey.

Adapted from Table 2, p. 3 and Table B-60, p. 111, *Young and Senior Science and Engineering Faculty, 1980*, National Science Foundation and from Atelsek, Frank J. and Gomberg, Irene L., *Young Doctoral Faculty in Science and Engineering: Trends in Composition and Research Activity*, p. 17.

Table I-16: Unfilled engineering faculty positions, September 1980

10% of all engineering faculty positions were unfilled as of September 1980, a total of nearly 1600 positions. Most of the individual engineering disciplines are close to this percentage except for aeronautical engineering which had only 4% unfilled positions, and computer engineering with a high of 16% unfilled and industrial engineering which had 13.4% unfilled. Generally, the top 50 schools have relatively fewer vacancies than the others, averaging about 2% less in all disciplines.

	Aeronautical		Chemical		Civil		Computer		Electrical		Indusrial		Mechanical		Other		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total Positions . . .	649	100.0	1382	100.0	2907		914		3570		1007		3121		2658		16,208	
All institutions . . . . Pos. Unfilled	26	4.0	136	9.8	276	9.5	146	16.0	333	9.3	135	13.4	275	8.8	257	9.7	1,583	9.8
"Top 50"	384	100.0	680		1279		369		1443		433		1170		1600		7,336	
Pos. Unfilled	16	4.2	51	7.5	93	7.3	51	13.8	116	8.0	39	9.0	93	7.9	119	7.4	578	7.9
Public Inst.	502		1008		2219		679		2480		790		2209		2028		11,915	
Pos. Unfilled	22	4.4	100	9.9	211	9.5	115	16.9	255	10.3	109	13.8	226	10.2	213	10.5	1,251	10.5
Public Inst.	147		374		688		234		1090		217		912		629		4,291	
Pos. Unfilled	5	3.4	35	9.4	65	9.4	31	13.2	77	7.1	25	11.5	48	5.3	44	7.0	330	7.7

Source: Higher Ed. Panel Report #52, American Council on Education, October, 1981.

Table I-17: Changes in engineering faculty 1979-80

The greatest number of faculty moves were in the field of computer engineering, with aeronautical engineering being the most stable. Private institutions and the top departments were somewhat more successful in retaining faculty than the overall average.

	Aeronautical		Chemical		Civil		Computer		Electrical		Industrial		Mechanical		Other		Total	
	No.	%	No.	%	No.	%	No.	%			No.	%	No.	%	No.	%	No.	%
All Institutions - Faculty Leaving For Industry — Pos. Unfilled	12	1.9	32	2.6	61	2.3	43	5.6	89	2.6	24	2.8	78	2.7	58	2.4	397	2.7
"Top 50" Institutions — Faculty Leaving for Industry — Pos. Unfilled	3	0.8	14	2.2	22	1.9	14	4.4	33	2.5	9	2.3	22	2.0	26	1.8	143	2.1
Public Inst. Pos. Unfilled	4	0.8	28	3.1	50	2.5	35	6.7	62	2.8	15	2.2	50	2.5	49	2.7	293	2.7
Private Inst. Pos. Unfilled	8	5.6	4	1.2	11	1.7	8	3.9	27	2.7	9	4.7	28	3.2	9	1.5	104	2.6

Source: Higher Ed. Panel Rept. #52, Amer. Council on Ed. 10/81

Table I-18: Full-time junior engineering faculty who did not receive their Baccalaureates in the United States

Nearly a quarter of all junior faculty teaching engineering in the United States received their baccalaureate outside of the U.S., and in public four-year colleges it is nearly a third.

Institutional Category	Total Junior Faculty	Percentage with Baccalaureate Outside the U.S.
Total	3,397	23.7
Top 50 Institutions*	1,400	22.1
Public Institutions	2,416	25.0
Private Institutions	981	20.5
Public Universities	1,768	22.3
Private Universities	683	19.2
Public Four-Year Colleges	648	32.4
Private Four-Year Colleges	298	23.5

*In level of engineering R&D expenditures, FY 79.

Source: Higher Education Panel Rept. #52 American Council on Education 10/81.

Table I-19: Engineering Faculty Salaries

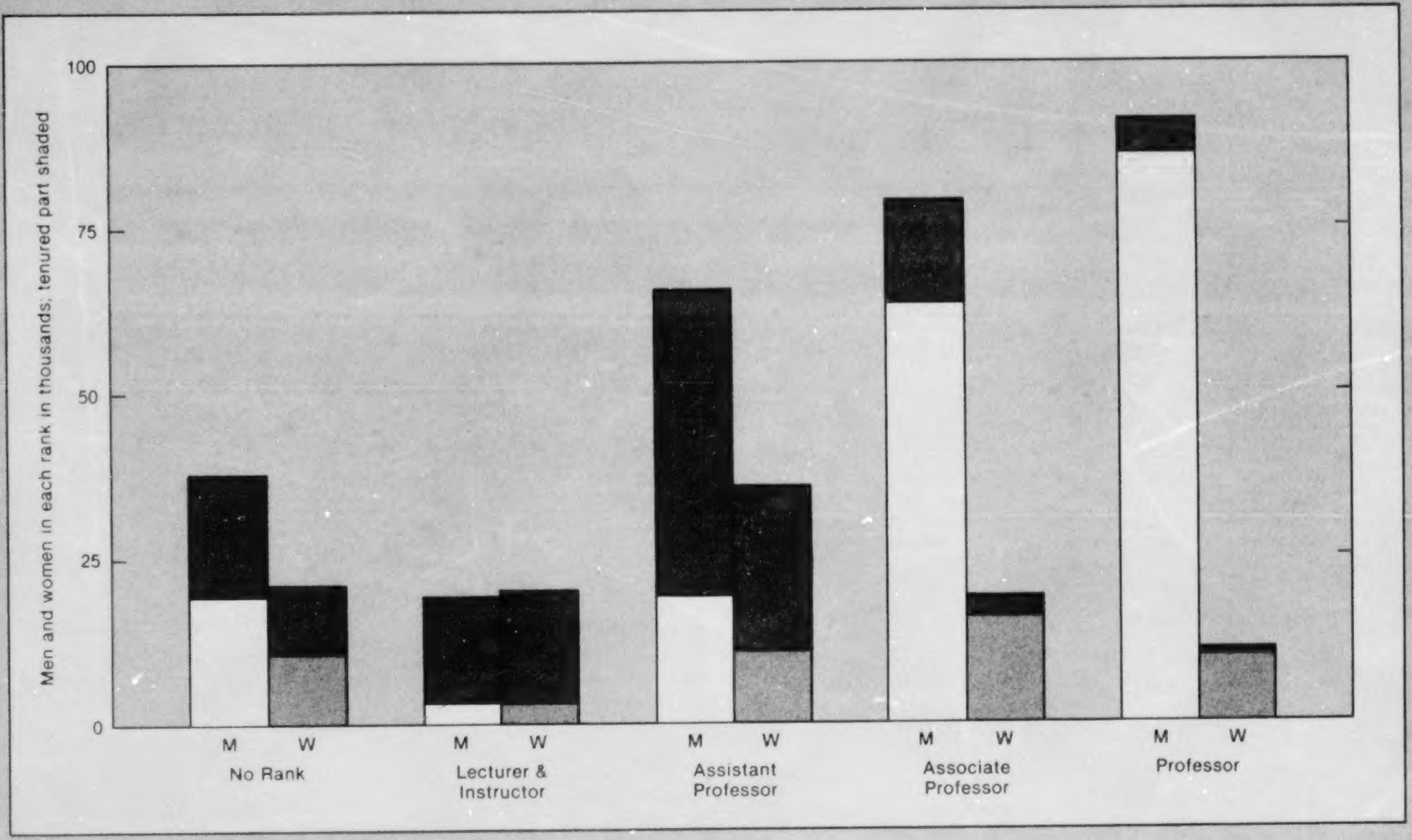
Faculty salaries, show a mean salary range of $34,500 for full professors at high-paying institutions down to $20,000 for assistant professors at low-paying institutions. They have increased in the past year by 8.8% for full professors and 11.4% for assistant professors, and average from $1,000 to $3,000 higher than professional academics' salaries in other undergraduate disciplines. Assistant professors' salaries are roughly comparable to offers being made to bachelor-degree engineering students when adjusted to a 12-month basis.

	9-10 mo.		
	Prof.	Assoc. Prof.	Asst. Prof.
68 State Univ: 78-79 and 79-80	$28,423 $30,524	$22,158 $23,276	$18,386 $19,931
All Institutions			
Average	$31,305	$24,769	$21,634
Percent Increase	8.8%	10.2%	11.4%
High	34,500	26,000	23,600
Median	31,609	25,125	21,500
Low	28,200	22,775	20,000
All Public Institutions			
Average	30,590	24,922	21,703
Change	9.0%	10.4%	11.6%
High	33,600	26,000	23,700
Median	31,609	25,400	22,000
Low	27,777	22,775	20,200
All Private and Public 4-Yr. Institutions			
Average	31,727	24,814	21,838
Change	8.8%	10.2%	12.1%
High	34,750	26,000	23,700
Median	31,884	25,125	22,000
Low	26,680	23,137	20,350
All Institutions			
Average, Fine Arts	27,979	22,846	16,770
Average, Business & Economics	30,349	25,872	20,737
Average, Humanities	29,108	21,112	17,724
Average, Science & Math	28,570	22,650	18,705
Average, Social Science	29,606	22,434	18,140

Source: Chronicle of Higher Education, Nov. 1980

Chart I-15: Distribution of Full-Time Faculty by Rank, Tenure Status, and Sex in 1979-1980

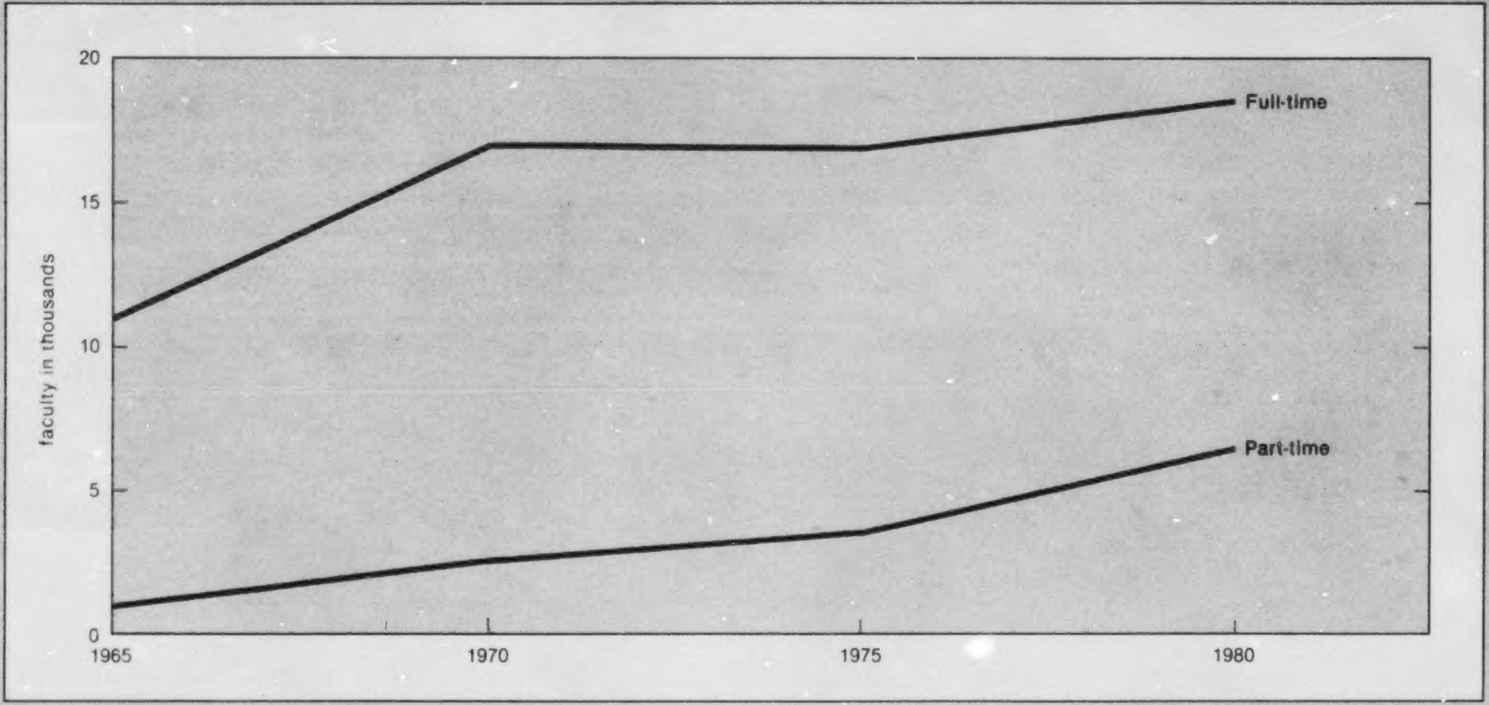
In all higher education men comprise 74% of the full-time faculty. Over 64% of these men hold tenure, compared to 43% of women faculty; men represent 90% of the full professors and 80% of the associate professors.



Source: Smith, C.R., *Faculty Salaries, Tenure, and Benefits 1979-80.*

Chart I-16: University and four-year college mathematical science faculty, 1965-1980

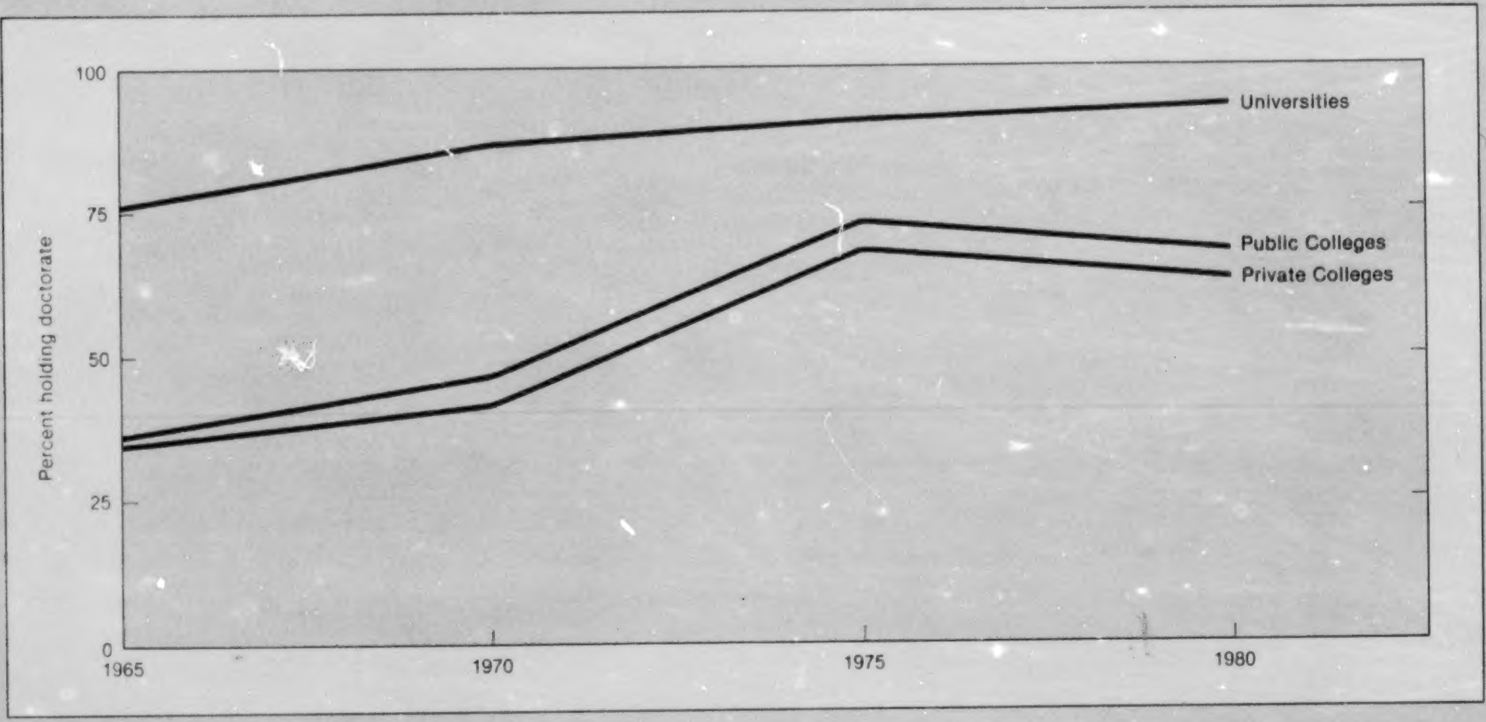
From 1975 to 1980 full-time mathematical science faculty increased by 8% and part-time faculty increased by 75%. The FTE faculty thus increased by 13% compared to an increase of 33% in mathematical science enrollments. The total FTE faculty in universities and four-year colleges increased by only 3% in the same time period.



Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Chart I-17: Doctorates among full-time mathematical science faculty

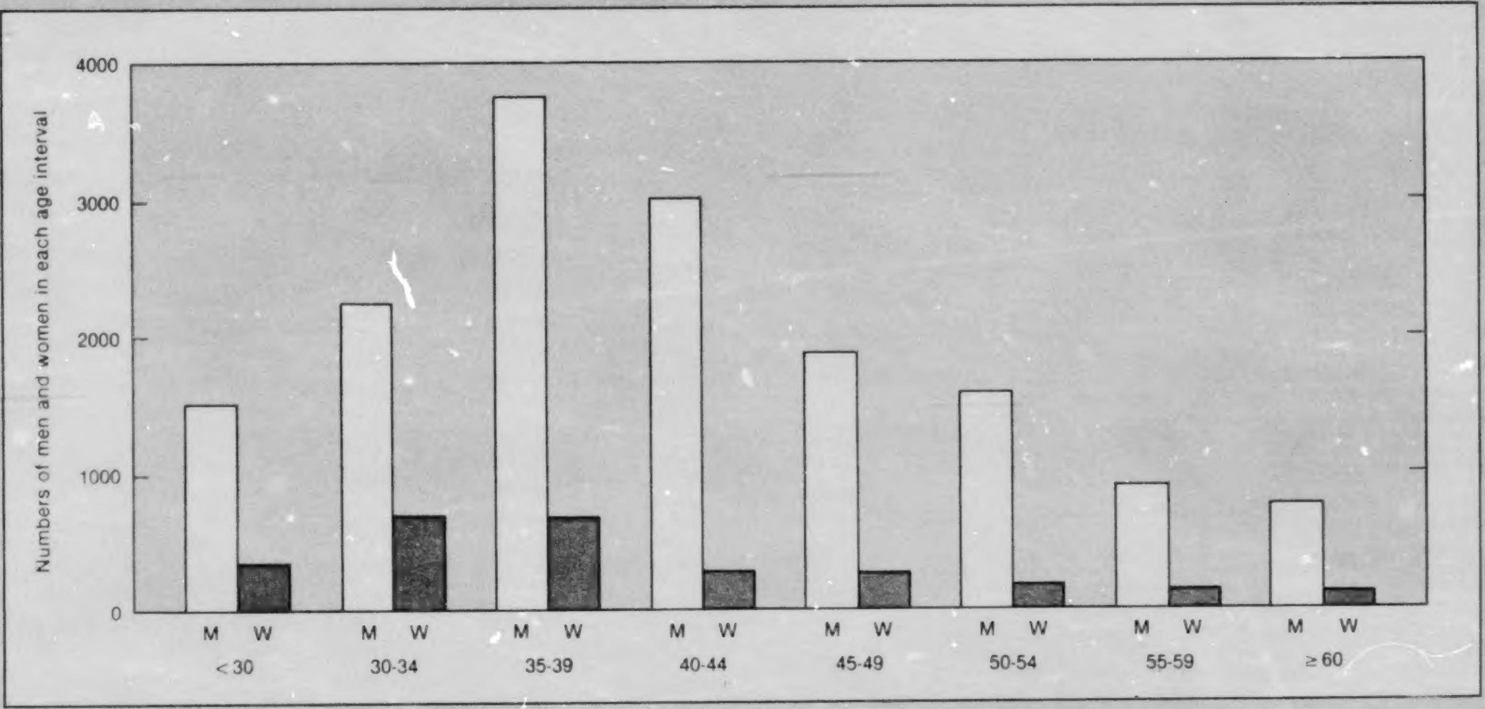
From 1975 to 1980 the fraction of public and private four-year college faculty with earned doctorates decreased, reversing the trend of 1965 to 1975.



Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Chart I-18: Distribution of full-time mathematical science faculty by age and by sex, 1980

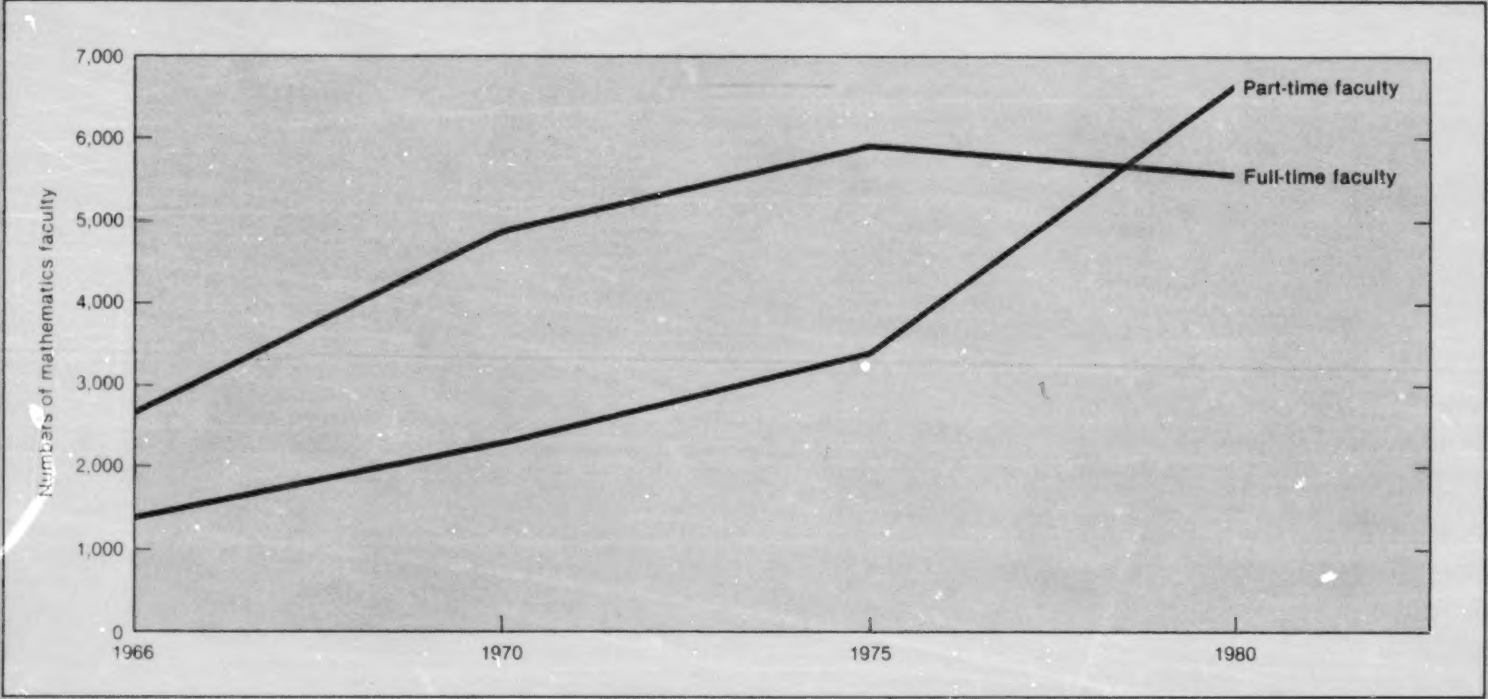
Women comprise 14% of mathematical science faculty, the greatest number in public colleges (18%) and least in universities (9%). All three figures are up substantially from 1975 when only 10% of the mathematical science faculty were women. The median age for women is about five years less than than for men.



Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Chart I-19: Trends in numbers of full- and part-time mathematics faculty

For mathematics in two-year colleges, part-time faculty now outnumber full-time faculty, making up 54% of the total. The part-time component of the mathematics faculty increased by 95% over the period 1970-1975. Equally striking is the *decrease* in the size of the full-time faculty. For *all* fields in TYC's, part-timers constitute 56% of the faculty.



Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

	1966	1970	1975	1980
Full-Time	2677	4879	5944	5623
Part-Time	1318	2213	3411	6661
FTE	3116	5617	7081	7843

Chart I-20: Educational qualifications of part-time mathematics faculty in two year colleges

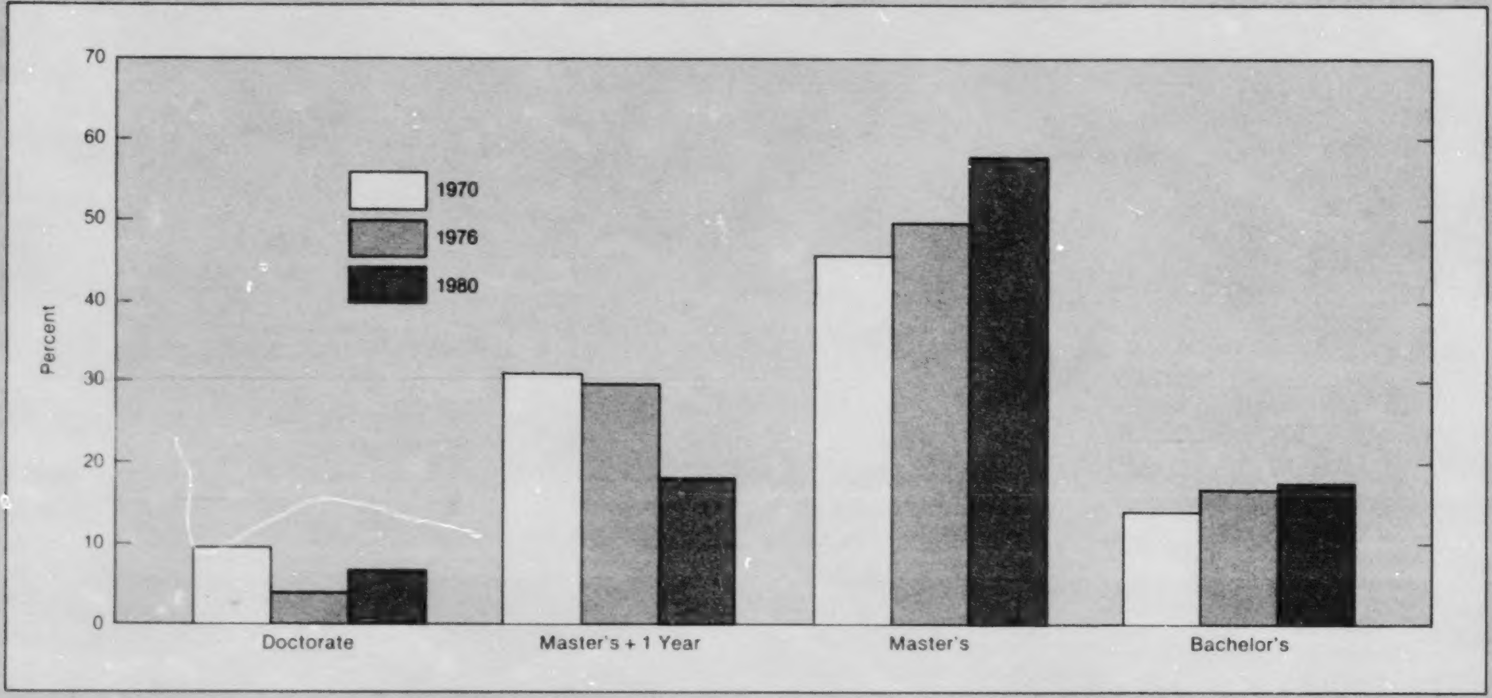


Table I-20: Educational qualifications of part-time mathematics faculty

Highest Degree	1970	1975	1980
Doctorate	9.5%	3.9%	6.7%
Master's + 1 Year	31.0%	29.9%	18.1%
Master's	45.5%	49.6%	57.6%
Bachelor's	14.0%	16.6%	17.4%

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

As compared with the 1970 figures, the percentages of part-time mathematics faculty in the doctorate or "master's + 1" highest degree categories have declined. Given an increase in the number of industrial opportunities for mathematicians, it is not likely that the educational qualifications of part-timers will increase in the near future.

Chart I-21: Percent of higher education institutions with access to computers, 1965-77

The percent of institutions with access to computers has more than doubled since 1965.

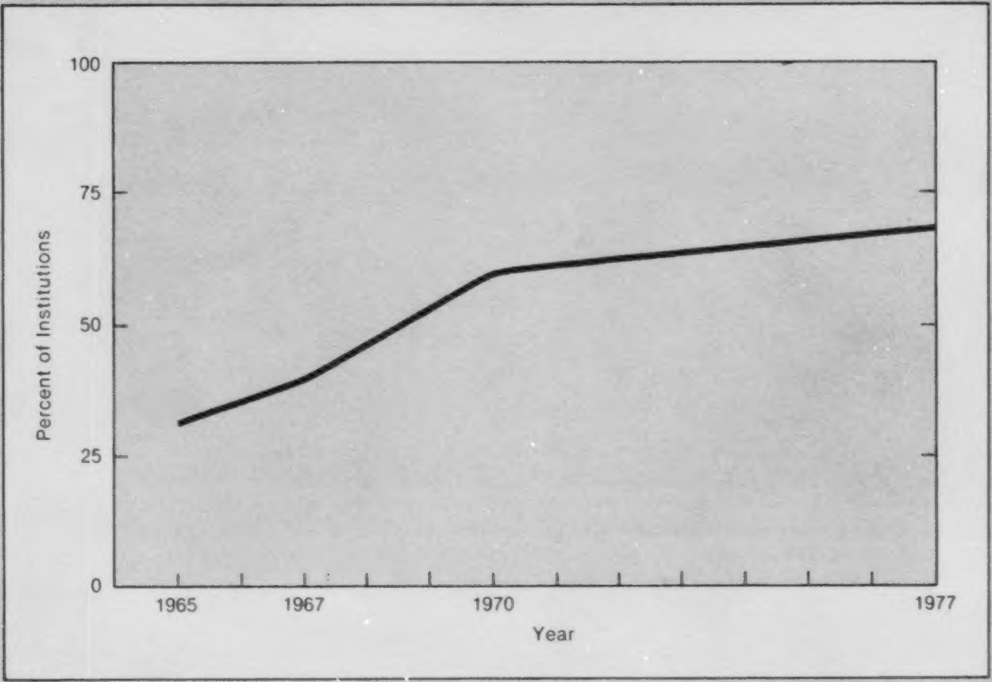


Table I-21 A: Estimated number and percent of U.S. institutions of higher education with access to computer facilities

	No. Institutions		
	Total	With access to computers	Percent with access to computers
SREB/NSF .... 1964-65 Survey June 30, 1965	2219	707	32%
SREB/NSF .... 1966-67 Inventory June 30, 1967	2477	980	40%
SREB/NSF .... 1969-70 Inventory June 30, 1970	2807	1681	60%
FICHE/NSF .... *1976-77 Inventory June 30, 1977	3136	2163	69%

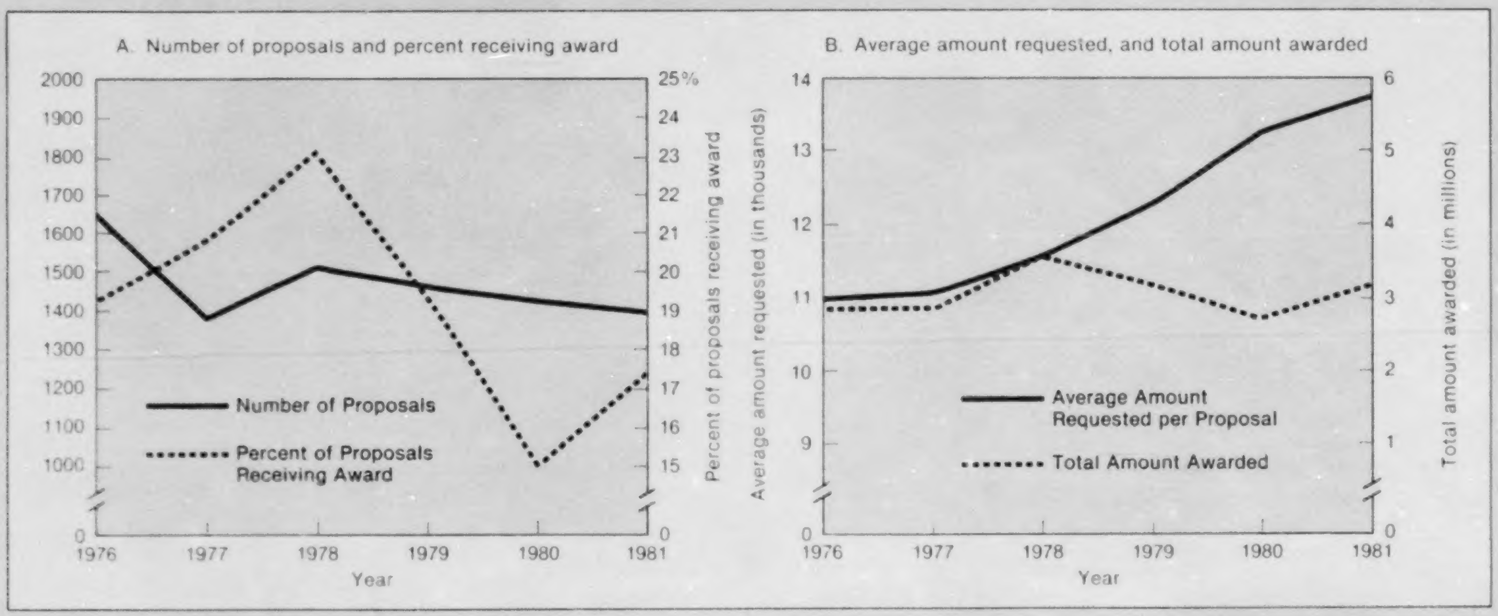
*Table I-21 B: Estimates of numbers of institutions with access to computers by highest level of offering June 30, 1977

Highest Level of Offering	Fall '75 Enrollment (millions)	Total # Institutions	# Institutions with access to computers	Percent with access to computers
Associate . . .	4.0	1196	801	67
Bachelor's. . .	.9	801	496	62
Master's	2.4	717	538	75
Doctorate . . .	3.9	422	328	78
Total	11.2	3136	2163	69

Source: Hamblen, John W. and Baird, Thomas B., *Fourth Inventory Computers in Higher Education*, pp. II-04,05.

Charts I-22, A&B: National Science Foundation, Instructional Scientific Equipment Program (ISEP) Data

Data from the Instructional Scientific Equipment Program, the major federal support of scientific equipment for undergraduate education, show fluctuations in proposal pressure, and a constant level of funding coupled with rising average requests.



A. Number of proposals and percent receiving award

B. Average amount requested, and total amount awarded

Table I-22: National Science Foundation, Instructional Scientific Equipment Program (ISEP) data

	1976	1977	1978	1979	1980	1981
Number of Proposals Received	1,649	1,378	1,515	1,457	1,431	1,399
Total Amount Requested	$18,137,196	$15,254,800	$17,595,900	$17,965,936	$18,644,232	$19,245,368
Average Amount of Requests	10,998	11,070	11,614	12,330	13,029	13,757
Total Amount Awarded	$ 2,940,000	$ 2,875,200	$ 3,553,300	$ 3,223,277	$ 2,736,556	$ 3,177,322
Percent of Proposals Receiving Award	19.4	20.9	23.2	19.5	15.1	17.5

Source: Directorate for Science Education, National Science Foundation, unpublished data

Chart I-23: National Science Foundation Science Education obligations by function as percent of total

The National Science Foundation has shifted support over time among students, faculty, institutions, and R&D.

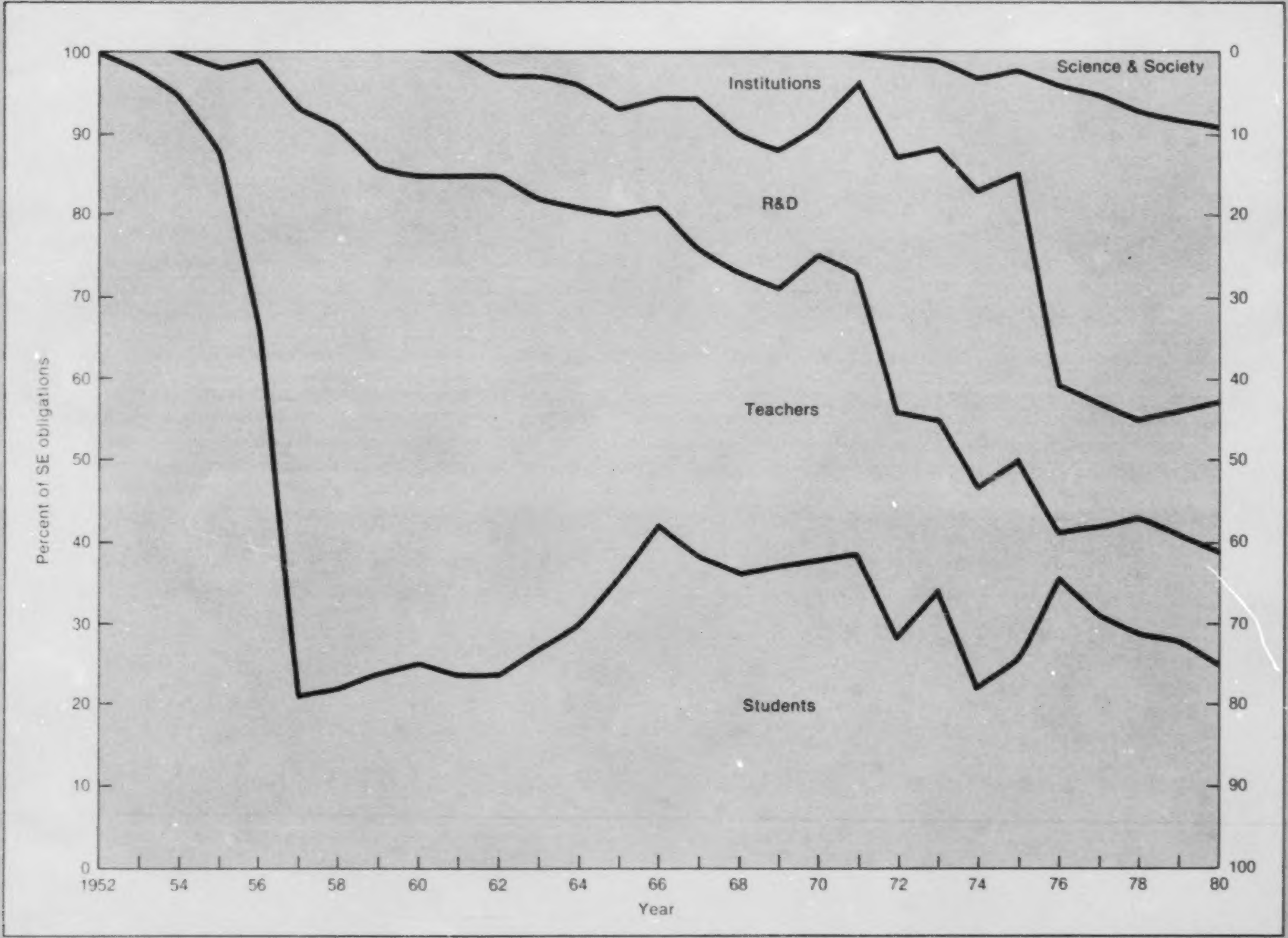


Table I-23: Estimated National Science Foundation science education obligations by function, by year (in millions of dollars)*

				Functions*									
				R&D**		Students		Teachers		Institutions		Science and Society	
Fiscal Year	Total NSF dollars	Total SE dollars	Percent SE of Total	%	$	%	$	%	$	%	$	%	$
1952	3.47	1.54	44.4	0	0	99.7	1.535	0.3	0.005	0	0	0	0
1953	4.42	1.41	31.9	0	0	98	1.38	2	0.03	0	0	0	0
1954	7.96	1.89	23.7	0	0	95	1.796	5	0.09	0	0	0	0
1955	12.49	2.10	16.8	3	0.06	88	1.85	10	0.21	0	0	0	0
1956	15.99	3.52	22.0	0.4	0.01	67	2.36	32	1.13	0	0	0	0
1957	38.63	14.30	37.0	7	1.00	21	3.00	72	10.30	0	0	0	0
1958	49.97	19.20	38.4	9	1.73	22	4.22	69	13.25	0	0	0	0
1959	132.94	61.29	46.1	14	8.58	24	14.71	62	38.00	0	0	0	0
1960	158.60	63.74	40.2	14	8.92	25	15.94	60	38.24	0	0	0.5	0.32
1961	174.99	63.44	36.3	15	9.52	24	15.23	61	38.70	0	0	0.5	0.32
1962	260.82	83.60	32.1	12	10.03	24	20.01	61	51.00	3	2.51	0.4	0.33
1963	320.75	98.72	30.8	15	14.81	27	26.65	55	54.30	3	2.96	0.4	0.39
1964	354.58	111.23	31.4	15	16.68	30	33.37	51	56.73	4	4.43	0.4	0.44
1965	415.97	120.41	28.9	13	15.65	36	43.35	44	52.98	7	8.43	0.3	0.36
1966	466.43	124.30	26.7	13	16.16	42	52.21	39	48.48	6	7.46	0.1	0.12
1967	465.10	125.82	27.1	17	21.39	38	47.81	38	47.81	6	7.55	0.3	0.38
1968	495.00	134.46	27.2	16	21.51	36	48.41	37	49.75	10	13.45	0.2	0.27
1969	400.00	115.30	28.8	18	20.75	37	42.66	34	39.20	12	13.84	0.2	0.23
1970	440.00	120.18	27.3	15	18.03	38	45.67	37	44.47	9	10.82	0.2	0.24
1971	513.00	98.81	19.3	23	22.73	38	37.55	35	34.58	4	3.95	0.4	0.40
1972	622.00	86.10	13.8	33	28.41	28	24.11	28	24.11	12	10.33	0.8	0.69
1973	645.74	62.23	9.6	34	21.16	34	21.16	21	13.07	11	6.85	1	0.62
1974	645.67	80.71	12.5	36	28.79	22	18.13	25	19.96	14	11.61	3	2.42
1975	693.20	74.03	10.7	35	26.65	26	19.00	24	17.90	13	10.00	2	1.49
1976	724.40	62.50	8.6	17	10.63	36	22.50	6	3.75	37	23.13	4	2.50
1977	791.77	74.30	9.4	15	11.15	31	23.03	11	8.17	38	28.23	5	3.72
1978	864.91	73.96	8.6	12	8.83	29	21.45	14	10.35	38	28.10	7	5.18
1979	928.40	80.00	8.6	14	11.20	28	22.40	13	10.40	36	28.80	8	6.40
1980	996.25	77.19	7.7	18	15.25	25	21.18	14	11.86	34	28.80	9	7.62
1981*	1,041.80	70.70	6.8	—		—		—		—		—	

*The functional categories of obligations are exemplified as follows. *Students* includes programs such as fellowships and precollege student science training. *Faculty* includes programs such as teacher institutes and faculty short courses. *Institutions* includes programs such as ISEP (equipment purchasing), LOCI (Local Course Improvement), and CAUSE (Comprehensive Assistance to Undergraduate Science Education). *Science and society* includes programs for improving the public understanding of science and studying the ethical issues in science and technology.

**Until 1977 development projects received most of the R&D funding.

***1981 Breakdown of obligations not available at time of printing.

Source: Directorate for Science Education, National Science Foundation, unpublished data.

Chart I-24: National Science Foundation Science Education obligations by level of education as percent of total

In regard to levels of education, NSF has shifted priorities over time. Funding of graduate and precollege education has become less significant, and undergraduate education more important.

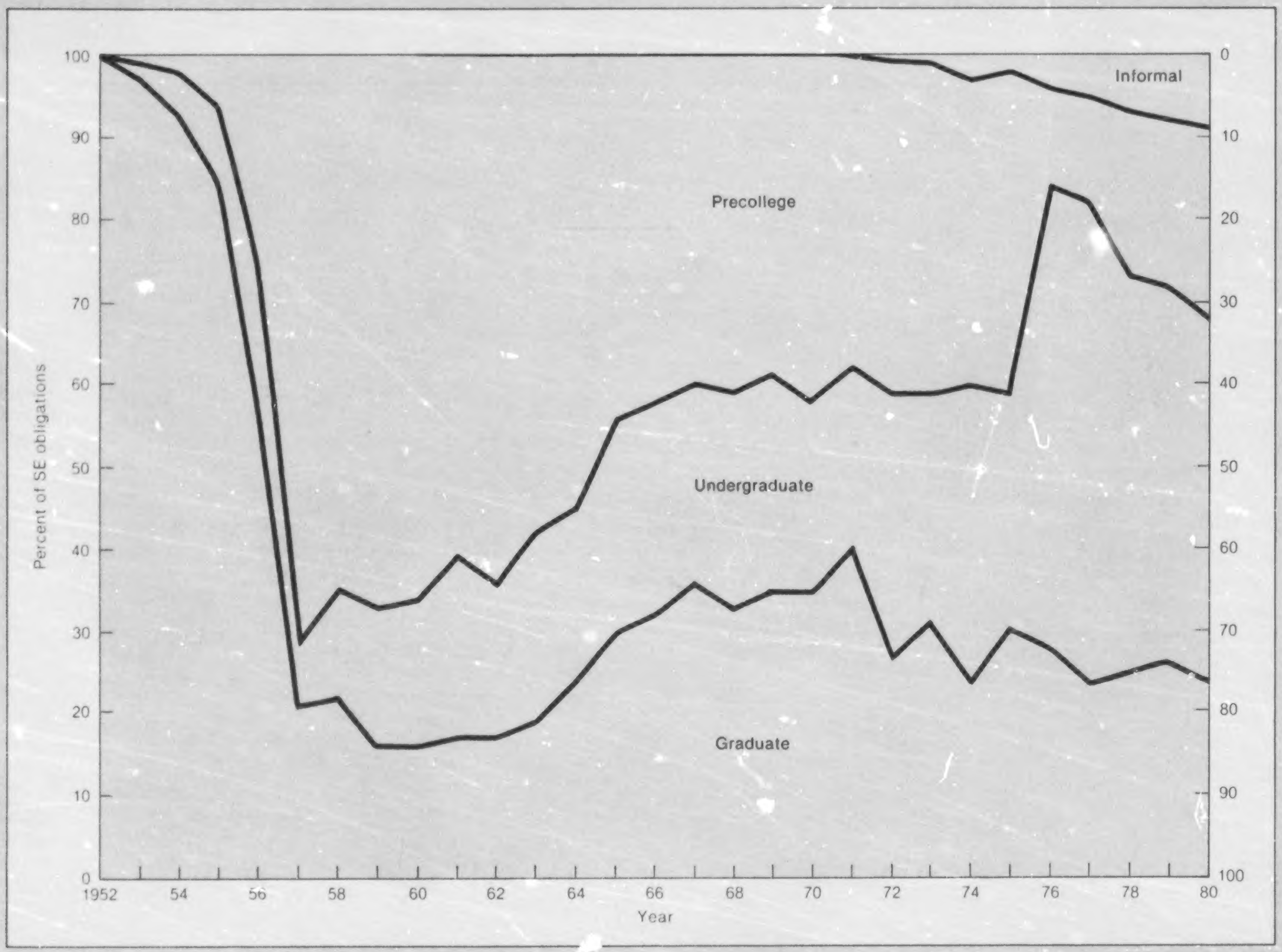


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Table I-24: Estimated National Science Foundation Education Obligations by *Level* of education, by year (in millions of dollars)*

Fiscal Year	Total NSF Dollars	Total SE Dollars	Percent SE of Total	LEVEL							
				Precollege		Undergraduate		Graduate		Informal	
				%	$	%	$	%	$	%	$
1952	3.47	1.54	44.4	0	0	0.3	.005	99.7	1.54	0	0
1953	4.42	1.41	31.9	0.7	0.01	2	.03	97	1.37	0	0
1954	7.96	1.89	23.7	2	0.04	5	.09	93	1.76	0	0
1955	12.49	2.10	16.8	6	0.13	9	.19	85	1.79	0	0
1956	15.99	3.52	22.0	24	0.85	16	.56	59	2.08	0	0
1957	38.63	14.30	37.0	71	10.15	8	1.14	21	3.00	0	0
1958	49.97	19.20	38.4	66	12.67	13	2.50	22	4.22	0	0
1959	132.94	61.29	46.1	67	41.06	17	10.42	16	9.81	0.03	0.02
1960	158.60	63.74	40.2	65	41.43	18	11.47	16	10.20	0.5	0.32
1961	174.99	63.44	36.3	61	38.70	22	13.96	17	10.78	0.5	0.32
1962	260.82	83.60	32.1	63	52.67	19	15.88	17	14.21	0.4	0.33
1963	320.75	98.72	30.8	57	56.27	23	22.71	19	18.76	0.4	0.39
1964	354.58	111.23	31.4	54	60.06	21	23.36	24	26.70	0.4	0.44
1965	415.97	120.41	28.9	44	52.98	26	31.31	30	36.12	0.3	0.36
1966	466.43	124.30	26.7	42	52.21	26	32.32	32	39.78	0.1	0.12
1967	465.10	125.82	27.1	40	50.33	24	30.20	36	45.30	0.3	0.38
1968	495.00	134.46	27.2	40	53.78	26	34.96	33	44.37	0.2	0.27
1969	400.00	115.30	28.8	39	44.97	26	29.98	35	40.36	0.2	0.23
1970	440.00	120.18	27.3	42	50.48	23	27.64	35	42.06	0.2	0.24
1971	513.00	98.81	19.3	37	36.56	22	21.74	40	39.52	0.4	0.39
1972	622.00	86.10	13.8	41	35.30	32	27.55	27	23.25	0.8	0.69
1973	645.74	62.23	9.6	39	24.29	28	17.42	31	19.29	1.0	0.62
1974	645.67	80.71	12.5	38	30.67	36	29.06	24	19.37	3	2.42
1975	693.20	74.03	10.7	38	28.13	29	21.47	30	22.21	2	1.48
1976	724.40	62.50	8.6	12	7.50	56	35.00	28	17.50	4	2.50
1977	791.77	74.30	9.4	13	9.69	58	43.10	24	17.83	5	3.72
1978	864.91	73.96	8.6	19	14.05	48	35.50	25	18.49	7	5.18
1979	928.40	80.00	8.6	20	16.00	46	36.80	26	20.80	8	6.40
1980	975.10	84.70	8.7	23	19.48	44	37.27	24	20.33	9	7.62
1981	1,041.77	85.70	8.2	—		—		—		—	
Total		2,129.49									

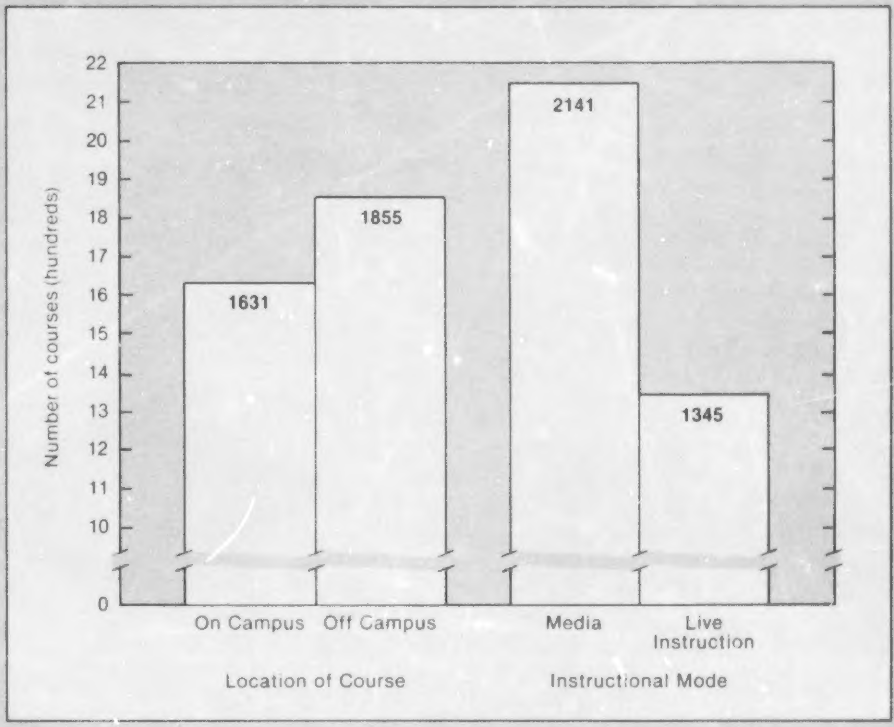
*1981 breakdown of obligations not available

(Estimates may not equal total due to rounding.)

Source: Directorate for Science Education, National Science Foundation, unpublished data.

Chart I-25: Number of continuing education degree credit courses for scientists and engineers

A continuing education degree credit course is defined to be a course directed primarily towards engineers and scientists with at least a bachelor's degree, but excluding courses directed primarily toward full-time students. Fifty-six universities offered 3486 such courses in 1975-76.



Source: Klus, John P. and Jones, Judy A., *Survey of Continuing Education Activities for Engineers and Scientists*, pp. 15-17.

Chart I-26: Number of continuing education non-credit activities for scientists & engineers, offered by universities and professional/technical organizations, 1975-76

During 1975-1976, there were 4909 separate activities for scientists and engineers. Of that total, 3519, or 72%, were given by universities and 1390, or 28%, by professional societies. Institutes and other brief programs (i.e., activity of less than 30 accumulated hours) were the most popular form of activity. There were 2223 institutes, 45% of the total.

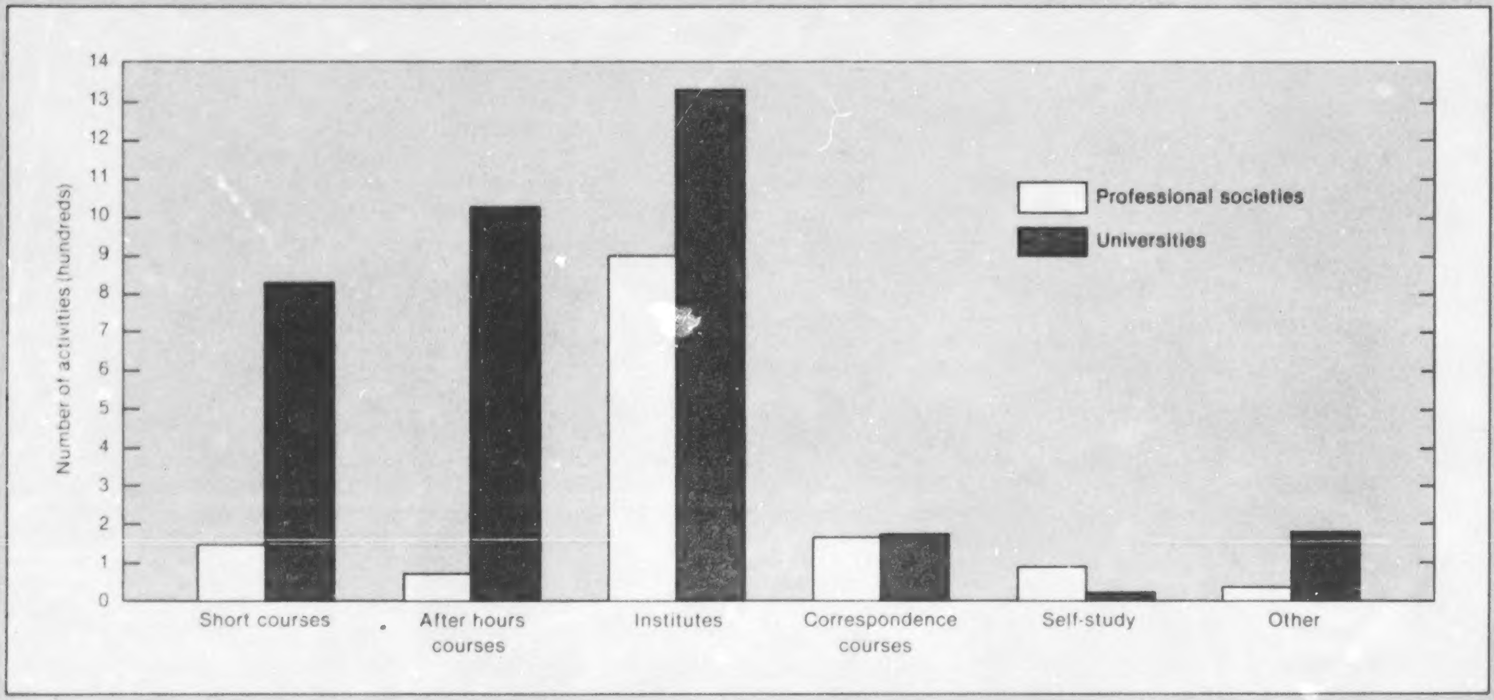


Table I-25: Number of continuing education non-credit activities for scientists and engineers offered by universities and professional/technical organizations, 1975-76

Institution	Number with one or more	Number of activities	Type of Activity*					
			Short courses	After-hours courses	Institutes	Corres-pondence courses	Self-study	Other
Universities	92	3519	821	1015	1323	167	19	174
Professional/Technical Organizations	55	1390	145	67	900	162	83	33
Total	147	4909	966	1082	2223	329	102	207

*The activities are defined as follows. *Short course* — organized instructional program on a specific subject that meets in all-day sessions for a minimum of 5 days amounting to at least 30 clock hours. *After-hours course* — organized instructional program on a specific subject presented in short segments over a pre-determined number of weeks. *Institute* — also called seminar, clinic, workshop; organized instructional program meeting for 5 hours or more in continuous sessions except for meals and recesses, lasting for less than 30 clock hours. *Correspondence course* — course cf instruction involving a continuing exchange between instructor and student conducted primarily by written communication. *Self-study* — program of instruction in which student is provided with all materials and left to proceed on his/her own with no direct aid from an instructor.

Source: Klus, John P. and Jones, Judy A., *Survey of Continuing Education Activities for Engineers and Scientists*, pp. 6-15.

Table I-26: Percentages of total cash operating income from foundations, corporations, and other non-governmental sources

In 1979, museums received less than one-fourth of their total operating income from private sources, such as foundations, corporations, individual contributions, and other sources. Art museums received the greatest relative percentage of their total operating income from private sources (25 percent) and parks and visitor centers the least (6 percent). On the whole, museums received approximately the same financial support (4 percent of total operating income) from each of foundations, individuals, and other sources. Financial support from corporations made up only an estimated 2 percent of total operating income.

	All Museums	Art	Children's	General	History	Parks and Visitor Centers	Science	Specialized
Total Operating Income	$1,088,086,733	$294,443,182	$8,449,854	$88,315,153	$260,712,507	$29,732,898	$379,817,942	$26,615,197
(Percent)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Total Private Support	166,364,067	$70,819,159	1,911,664	13,671,125	25,288,489	1,863,116	47,761,878	5,048,637
(% Total Operating Income)	(15.0)	(25.0)	(23.0)	(16.0)	(9.0)	(6.0)	(13.0)	(19.0)
Foundations	45,639,383							
(% Total Operating Income)	(4.2)	(5.4)	(6.9)	(3.7)	(2.3)	(2.5)	(4.7)	(2.8)
Corporations	25,904,158							
(% Total Operating Income)	(2.3)	(4.6)	(4.8)	(1.8)	(1.2)	—	(1.7)	(2.9)
Individual Contributions	47,097,190							
(% Total Operating Income)	(4.3)	(6.3)	(7.9)	(3.9)	(3.3)	(1.2)	(3.6)	(6.8)
Other	47,723,336							
(% Total Operating Income)	(4.4)	(7.6)	(2.9)	(6.0)	(2.9)	(2.5)	(2.5)	(6.2)

Source: Contractor Report, Museum Program Survey, 1979. National Center for Education Statistics, p. 52.

Table I-27: Trends in educational roles, by size of total operating expenditure: United States, fiscal year 1979

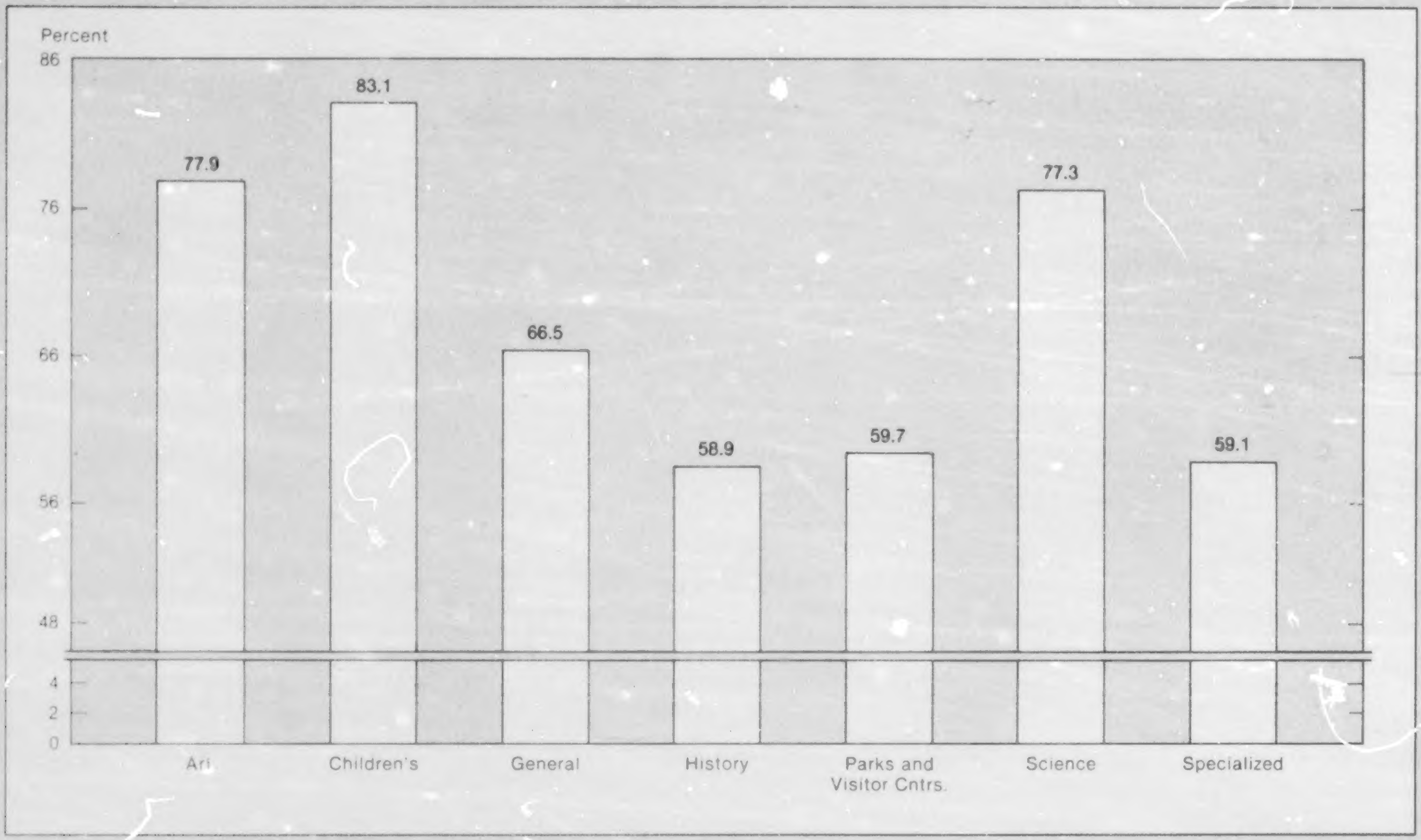
Museums with higher operating income were more likely to have increasing educational roles. Conversely, those institutions with the lowest operating incomes were more likely to indicate that their educational roles were staying the same.

		Total Operating Expenditure								
Trends in Educational Role	Total	None	$1 - $25,000	$25,001-$50,000	$50,001-$75,000	$75,001-$100,000	$100,001-$200,000	$200,001-$300,000	$300,001-$400,000	More Than $400,000
Total	4,408	65	1,800	578	365	269	545	173	150	463
Percent	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Increasing	2,935	18	1,003	422	269	195	396	140	103	390
Percent	66.6	27.1	55.7	73.1	73.6	72.6	72.7	80.8	68.7	84.1
Decreasing	89	0	50	8	4	11	6	4	5	3
Percent	2.0	.0	2.7	1.3	1.1	4.1	1.0	2.0	3.0	.7
Remains the Same	1,384	47	748	148	93	63	143	30	43	71
Percent	31.4	72.9	41.5	25.6	25.3	23.4	26.3	17.2	28.3	15.2

Source: Contractor Report, Museum Program Survey, 1979. National Center for Education Statistics, p. 71.

Chart I-27: Distribution of institutions offering specific programs, by type of museum

An estimated 66 percent of all museums offered some type of specific program in fiscal year 1979. Children's museums (83 percent) and art and science museums (78 percent) were more likely to have specific programs than other types of museums.



Source: Contractor Report, Museum Program Survey, 1979. National Center for Education Statistics, p. 75.

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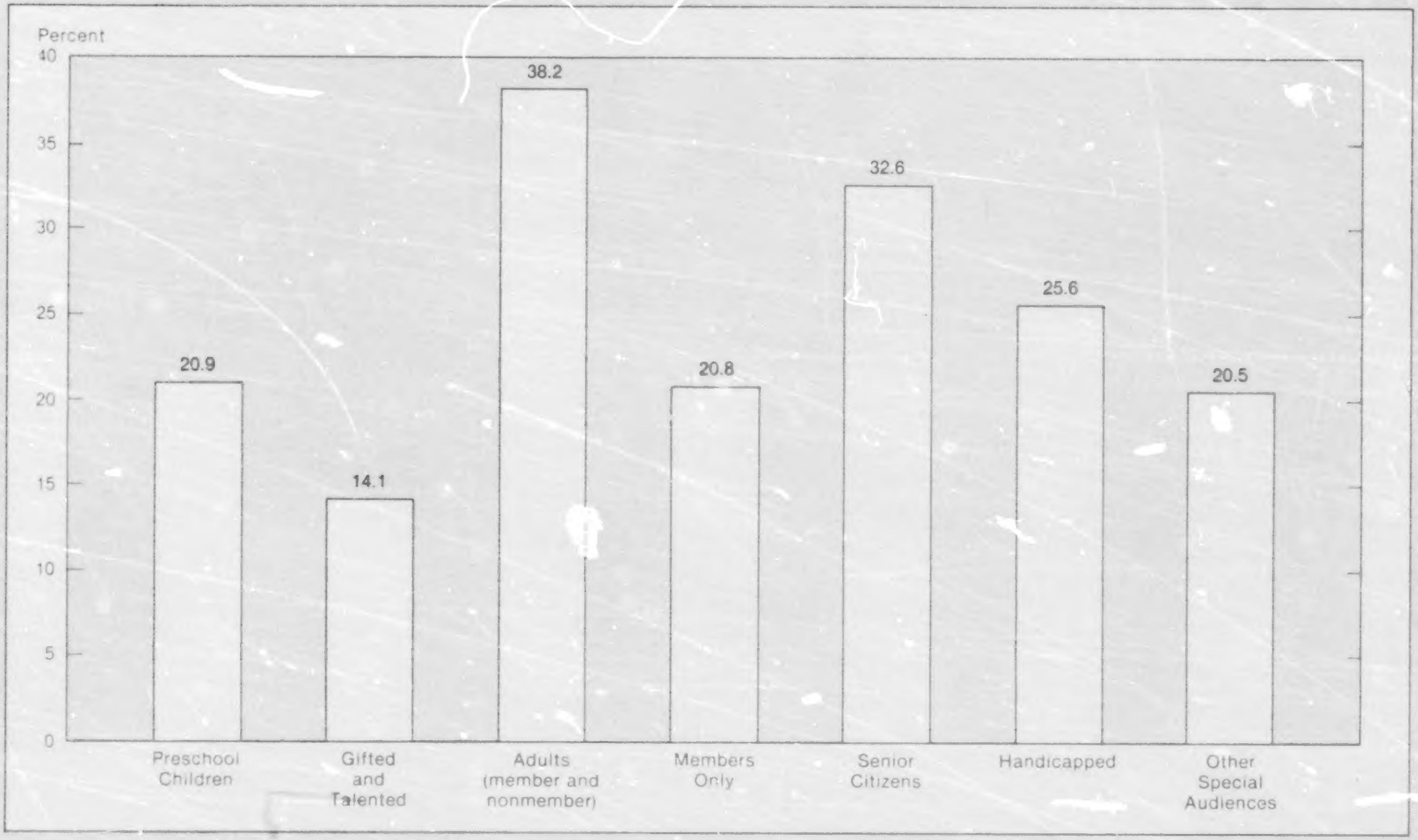
Chart I-28: Museums offering special programs* for specific groups: United States, 1979

Chart I-26 depicts the percentage of all museums offering programs for pre-school children, gifted and talented, adults (member and nonmember), members only, senior citizens, handicapped persons, and other special audiences.

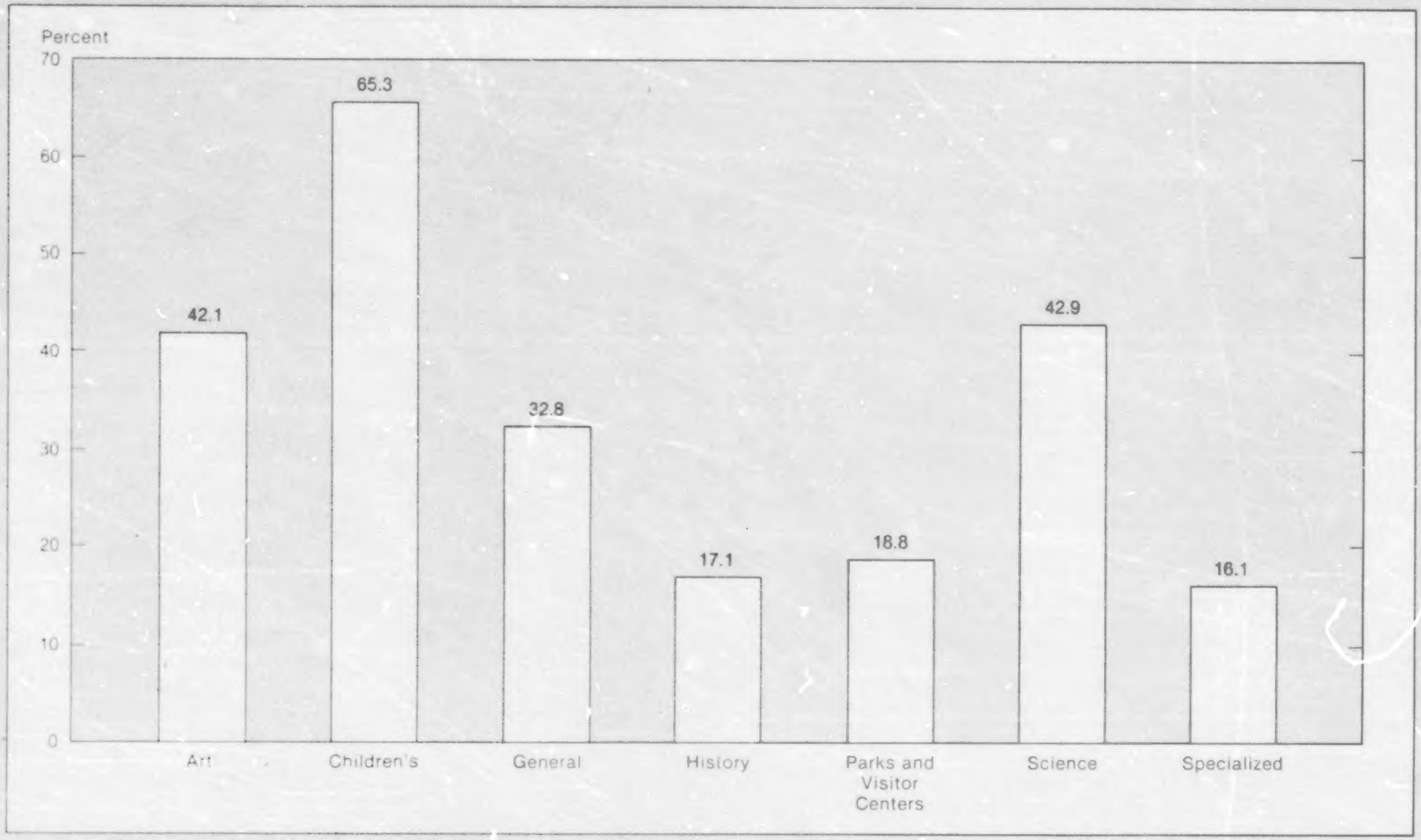


*Museums offering one or more special programs during the fiscal year as reported = 65.8% of all museums.

Source: Contractor Report, Museum Program Survey, 1979. National Center for Education Statistics, p. 76.

Chart I-29: Museums offering teacher training, by type of museum

Approximately one-fourth of the museums offered teacher training periodically or on a regular basis on how to use museum resources. An estimated 65 percent of the children's museums offered teacher training. Around 40 percent of science museums and art museums offered such training; only 16 percent of the specialized museums offered some type of teacher training.



Source: Contractor Report, Museum Program Survey, 1979. National Center for Education Statistics, p. 45, p. 80.

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Chart I-30: Federal funding of science-technology centers and museums[1]

These data estimate federal support to science-technology centers and museums. Between 1972 and 1978, the Federal government made grants of slightly over $30 million. National History museums received about $12.2 million, general museums $9.2 million, science-technology centers $6.9 million, and aquariums and zoos $2.6 million.

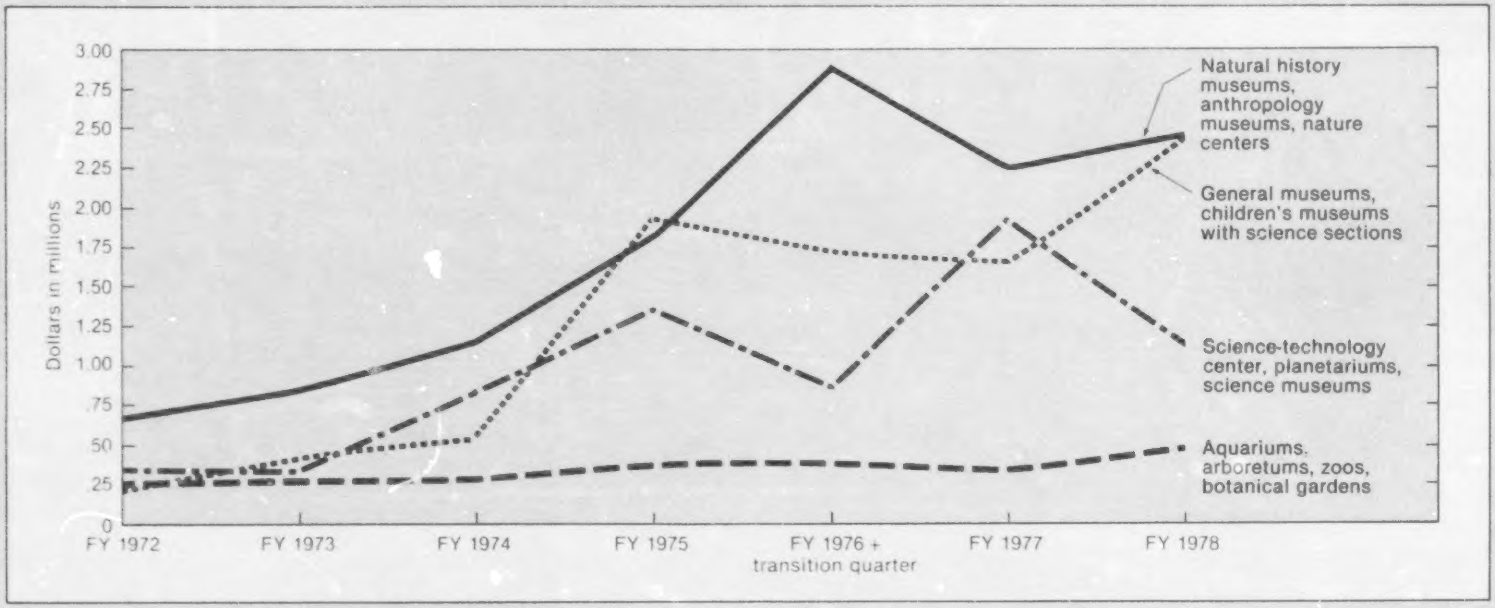


Table I-30: Federal funding of science-technology centers and museums

Museum Type	FY 1972	FY 1973	FY 1974	FY 1975	FY 1976	FY 1977	FY 1978
Science-Technology Centers, Planetariums, Science Museums	$ 360,117	$ 344,317	$ 839,727	$1,375,396	$ 861,191	$1,958,492	$1,126,745
Natural History Museums, Anthropology Museums, Nature Centers	$ 693,096	$ 860,602	$1,172,517	$1,825,954	$2,951,405	$2,264,400	$2,444,954
Aquariums, Aboretums, Zoos, Botanical Gardens	$ 254,900	$ 272,850	$ 289,060	$ 443,457	$ 415,100	$ 360,115	$ 584,624
General Museums, Children's Museums with science sections	$ 230,250	$ 420,865	$ 535,105	$1,957,518	$1,765,742	$1,739,542	$2,581,727
TOTALS	$1,538,363	$1,898,634	$2,836,409	$5,602,325	$5,993,438	$6,322,549	$6,738,050

[1] Challenge grants are excluded from these totals. Funding is from the National Endowment for the Arts, National Endowment for the Humanities, National Museum Act, and National Science Foundation.

Source: Association of Science-Technology Centers, *ASTC Science Museum Funding Study*, pp. 1-3, and unpublished data.

Chapter II
PARTICIPATION

INTRODUCTION

This chapter presents data on how many and what kinds of people participate in science, mathematics, and technology education and what form that participation takes. The data are grouped into two categories: K-12 and higher education.

HIGHLIGHTS

K-12

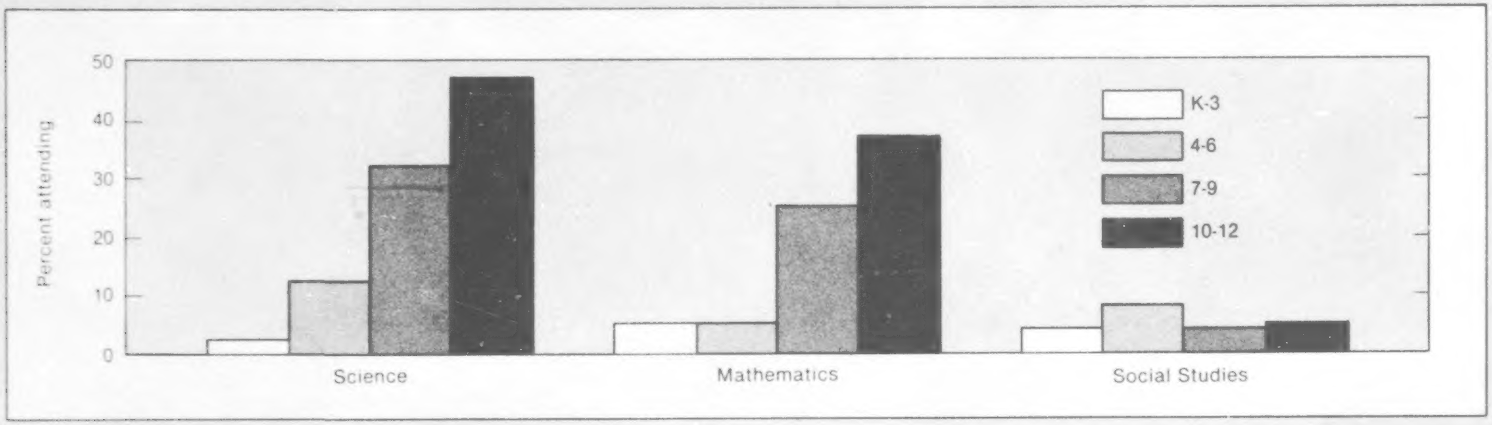
1. More than one-third of all high school mathematics teachers and almost half of all high school science teachers have participated in at least one NSF-sponsored activity. (Chart II-1)
2. On the average, a higher percent of 13-year-olds than 17-year-olds report participating in science-related activities outside of school. (Chart II-2)
3. There has been an increase in the total number of people attending museums belonging to the Association of Science/ Technology Centers (ASTC) between 1975 and 1977. (Charts II-3, A&B)
4. TV is the most frequently reported source of information about energy issues, but the print media is the most frequently reported source of information about new developments in energy science and technology. (Chart II-6)
5. Most college-bound high school students continue to take the standard course preparation including 3+ years of mathematics and 2+ years of science. (Chart II-7)
6. Honors courses in mathematics and English enrolled higher percents (both 14.5) of students than other honors courses. (Chart II-8)
7. In high school nearly equal proportions of males and females take mathematics courses. (Chart II-9)
8. A substantially large percent of Asian or Pacific Islander seniors take algebra I, algebra II, and geometry. (Chart II-10)

Higher Education

1. Black, Hispanic, and American Indian seniors were significantly more likely than whites to have taken remedial mathematics courses, while Asian/Pacific Islanders were less likely to have taken such courses. (Chart II-11)
2. Since 1965, full-time-equivalent (FTE) enrollments in higher education have grown by 100%. The two-year college share of this enrollment has increased from 17% to 34%, but more than half of the TYC enrollment is in non-degree-credit occupational/technical programs. (Chart II-12)
3. Among those declaring a major in the sciences at two-year institutions, engineering accounts for as many students as all the other sciences combined. (Chart II-13)
4. Between 1969 and 1976, undergraduate enrollments in the social sciences declined by more than 50%. (Chart II-14)
5. As a percentage of total engineering degrees, women have increased their share. (Chart II-15)
6. While more undergraduates enroll in engineering than any other science, women and minorities find their greatest representation in the biological sciences. (Chart II-16)
7. At the graduate level in 1978, women accounted for approximately one-third of the enrollments in the biological sciences but for only 7% of those in engineering. (Chart II-17)
8. Undergraduate engineering enrollments are rising significantly. (Chart II-18)
9. From a relative minimum in 1973, undergraduate engineering enrollments have grown steadily to an all-time high of 365,000 in 1980. Since the number of freshman engineering students was also an all-time high in that year, the influence of engineering enrollments on mathematics course demand is likely to continue strong over the next several years. (Chart II-19)
10. Between 1975 and 1980 all mathematical science enrollments increased by 33%, compared to 7% for FTE enrollments in all fields. The 30% increase in calculus and the 196% increase in computing courses led the way. (Chart II-22)
11. Since 1960, enrollment in remedial arithmetic, general mathematics, and algebra has increased by 165%. Those courses now constitute 16% of all mathematics enrollments, compared to 13% in 1960. The biggest increase occurred between 1975 and 1980, matching a period of widespread reports that high school preparation in mathematics has declined sharply. (Chart II-23)
12. Computer science courses now generate over 16% of all mathematical science enrollments and they are increasingly given by separate departments of computer science. As in mathematics and statistics, the largest share of computer science enrollment is in lower level courses. (Chart II-24)
13. There has been strong enrollment growth in nearly every computer science course offering. However, the bulk of the increase from 1975 to 1980 occurred in beginning programming courses. (Table II-12C)
14. Approximately 30,000 scientists and engineers enrolled in continuing education credit-granting courses in 1975-76. (Chart II-25)
15. Almost 187,000 scientists and engineers enrolled in continuing education non-credit activities during 1975-76. (Chart II-26)

Chart II-1: Percent of teachers as of 1977 who attended an NSF-sponsored institute, workshop, or conference

Participation by teachers in NSF-sponsored activities increases with grade level. More than one-third of all high school mathematics teachers and almost half of all high school science teachers have participated in at least one such activity. Mathematics and science teachers, especially at the higher grade levels, are much more likely to have participated than social studies teachers.



Source: Weiss, Iris R., *et al. The Status of Pre-College Science, Mathematics, and Social Studies Educational Practices in U.S. Schools: An Overview and Summaries of Three Studies*, p. 6. (Highlights Report)

Table II-1: Percent of educators attending one or more NSF-sponsored institutes, workshops or conferences

	Yes	No	Missing Or Inconsistent Response[1]
State Supervisors			
Mathematics (N = 50)	77	21	2
Science (N = 61)	79	15	6
Social Studies (N = 62)	60	35	5
K-6 District Program Q. Respondents			
Mathematics (N = 327)	18	63	19
Science (N = 326)	28	54	18
Social Studies (N = 303)	16	66	18
7-12 District Program Q. Respondents			
Mathematics (N = 321)	39	54	8
Science (N = 318)	46	48	6
Social Studies (N = 298)	21	71	8
Principals			
K-3 (N = 317)	10	85	5
4-6 (N = 292)	11	83	7
7-9 (N = 298)	13	81	6
10-12 (N = 270)	25	71	4
K-3 Teachers			
Mathematics (N = 297)	5	87	9
Science (N = 287)	2	91	8
Social Studies (N = 254)	4	87	9
4-6 Teachers			
Mathematics (N = 277)	5	85	10
Science (N = 271)	12	80	7
Social Studies (N = 281)	8	88	4
7-9 Teachers			
Mathematics (N = 550)	25	67	8
Science (N = 535)	32	63	4
Social Studies (N = 453)	4	90	6
10-12 Teachers			
Mathematics (N = 548)	37	60	3
Science (N = 586)	47	44	9
Social Studies (N = 490)	5	84	10

[1] Includes persons who indicated they had attended one or more NSF-sponsored activities but then failed to circle the ones attended and those who said they had not attended any and then circled one or more.

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 69.

Chart II-2: Percentages of 13- and 17-year-olds participating in various science-related activities outside of science classes

On the average, a higher percent of 13-year-olds than 17-year-olds report participating in science-related activities outside of school. The activities that 17-year-olds report more frequently than 13-year-olds, however, are reading science articles and watching science shows on TV.

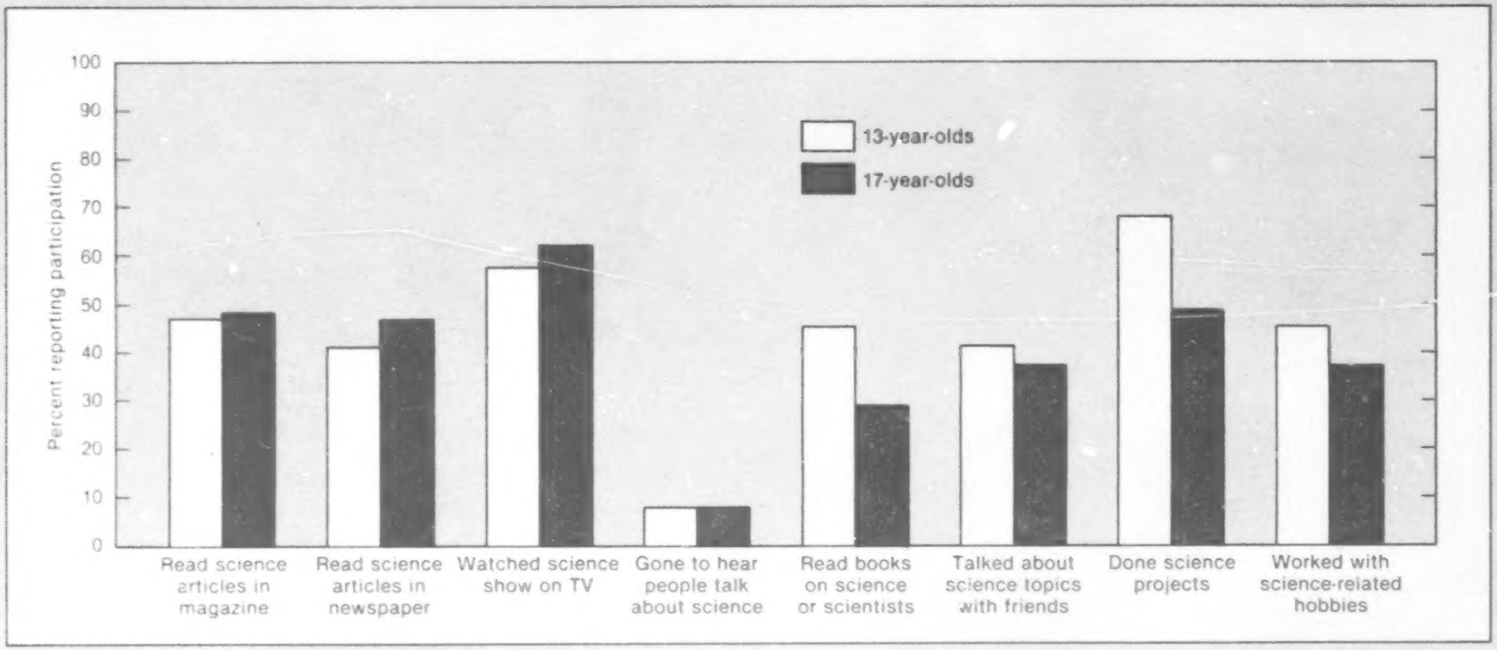


Table II-2: Percentages of 13- and 17-year-olds participating in various science-related activities outside of science classes

How often have you done each of the following activities when *not required* for science class?

	Percent Saying They Often or Sometimes Participate	
	Age 13	Age 17
Read science articles in magazines	47	48
Read science articles in newspapers	41	47
Watched science shows on TV	58	62
Gone to hear people give talks on science	8	8
Read books about science or scientists	45	29
Talked about science topics with your friends	41	37
Done science projects	68	49
Worked with science-related hobbies	45	37
Average percentage reporting participation	44	39

Source: National Assessment of Educational Progress, *Attitudes Toward Science*, p. 9.

Charts II-3, A&B: Attendance at science museums, Association of Science-Technology Centers (ASTC), 1975-77

The Association of Science-Technology Centers (ASTC) reports a general increase in attendance at its members — science museums, and science and technology centers. Forty-nine of its members showed a 13% increase in their combined attendance figures over a three-year period.

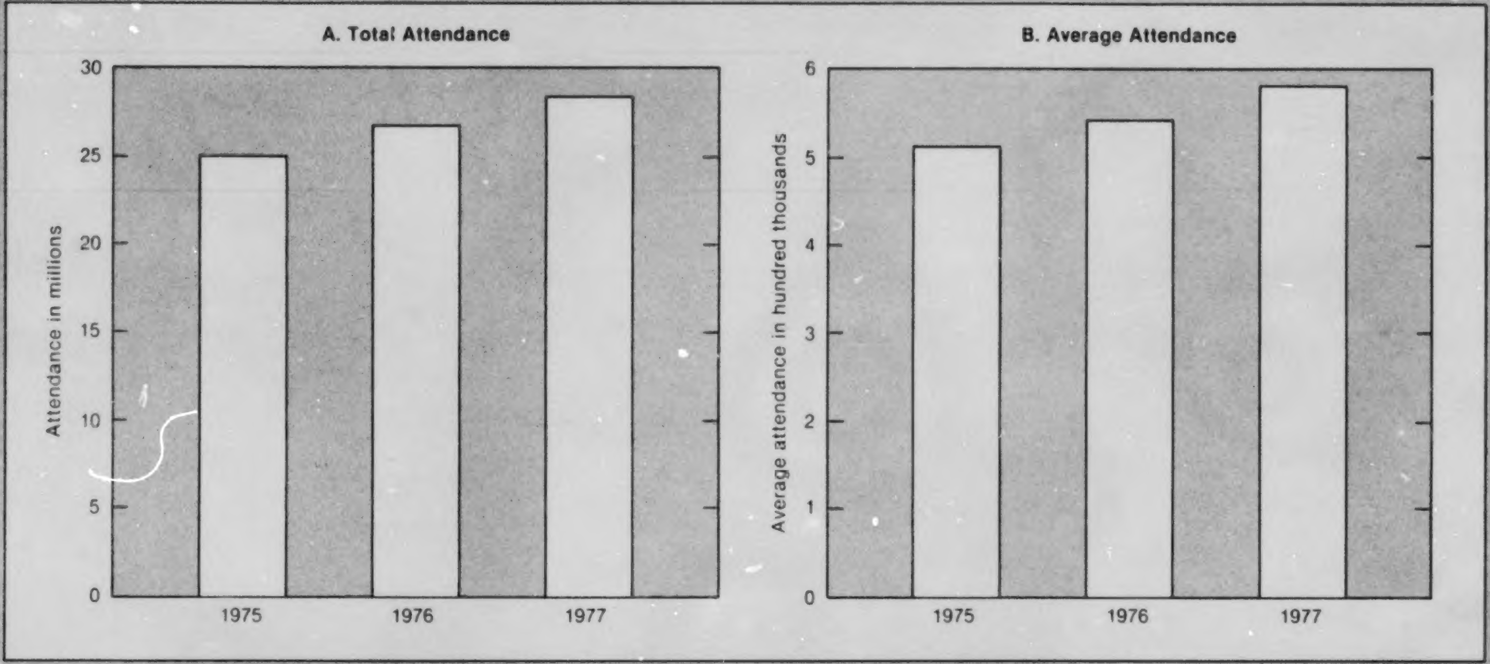


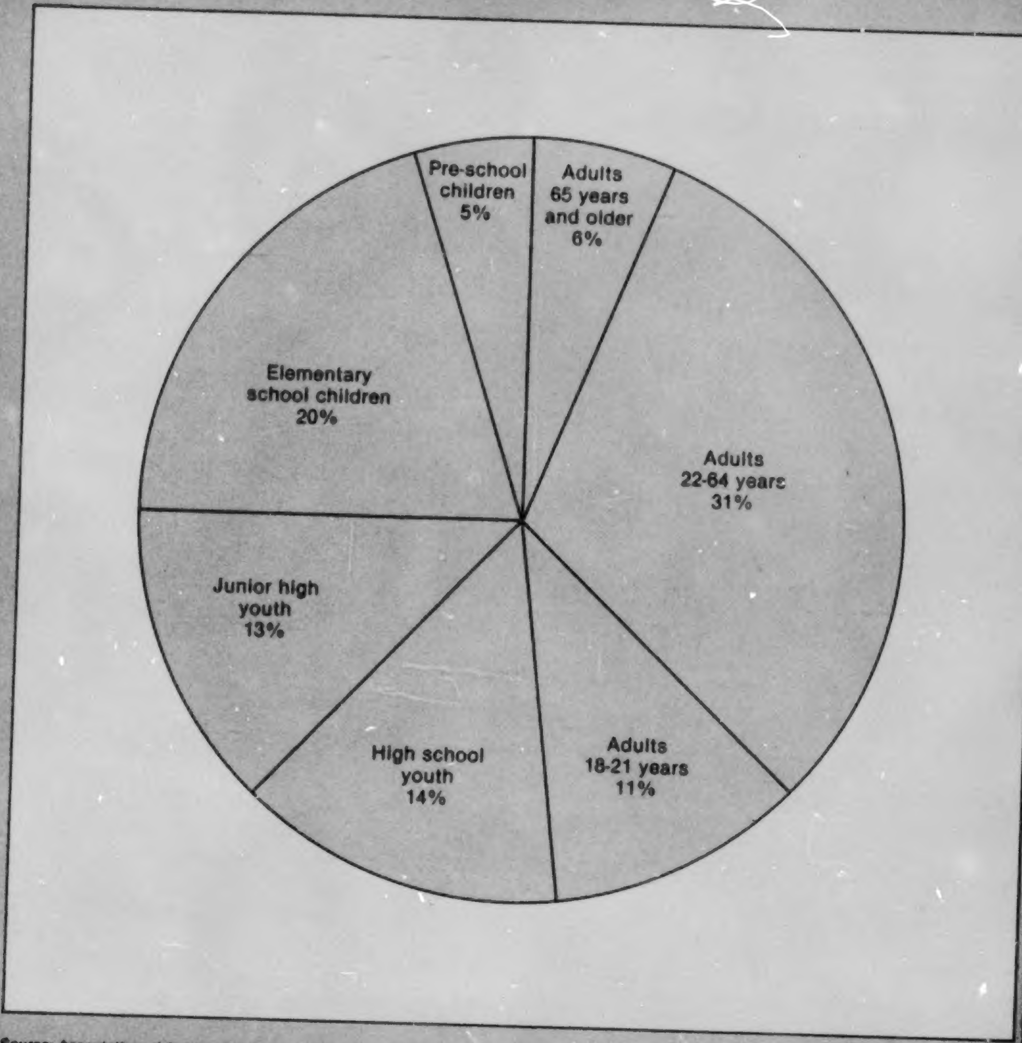
Table II-3: Attendance at science museums, Association of Science-Technology Centers (ASTC), 1975-77

Year	Combined Attendance	Average Attendance
1975	25,010,114	510,410
1976	26,556,428	541,967
1977	28,292,803	577,404
N = 49		

Source: Association of Science-Technology Centers, unpublished data.

rt II-4: Science museum ance by age, as percent of total

museum attendance is about ly divided between adults and children



Source: Association of Science-Technology Centers, 1977-78 member survey, unpublished data.

Chart II-5: Circulations of popular science magazines

Although there have been slight fluctuations, circulation for all five science magazines has increased in the past decade.

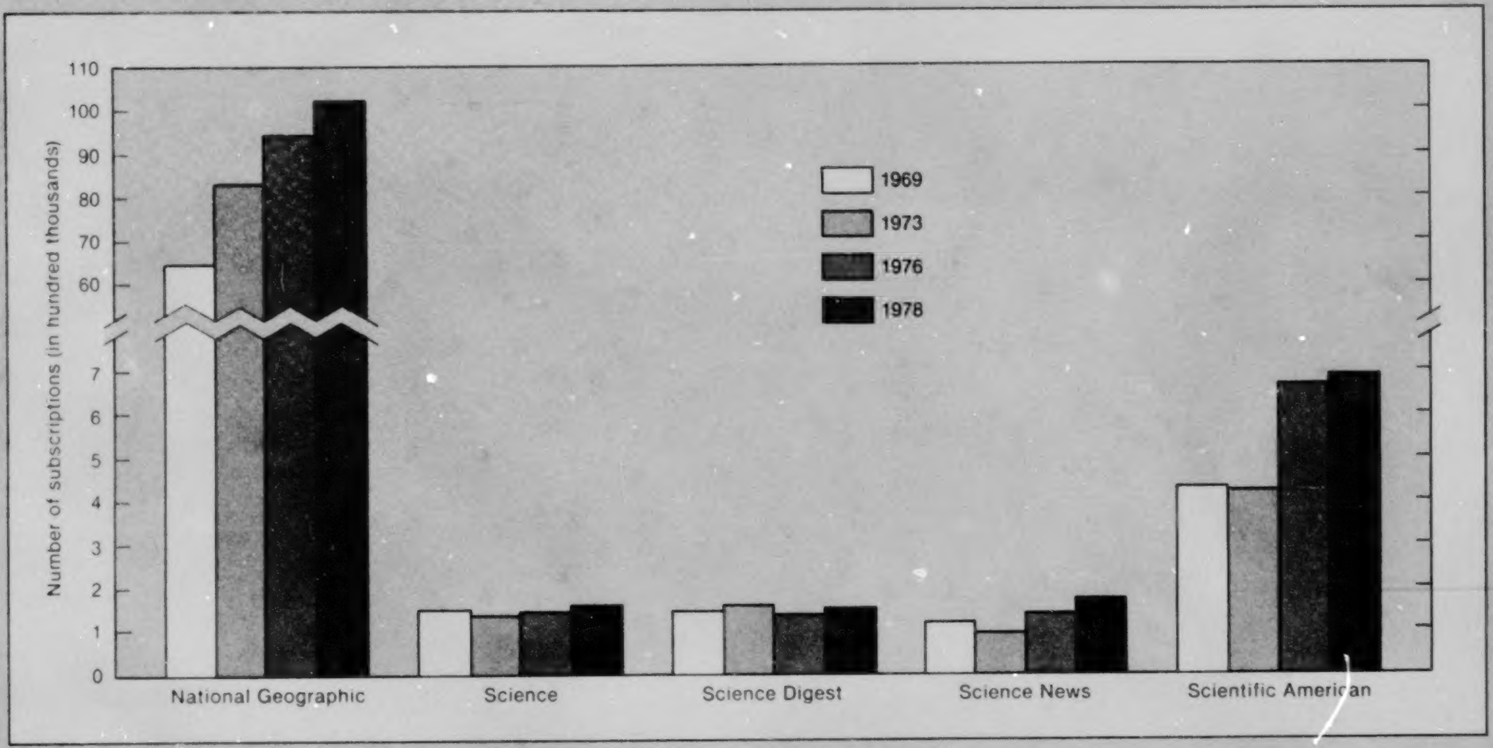


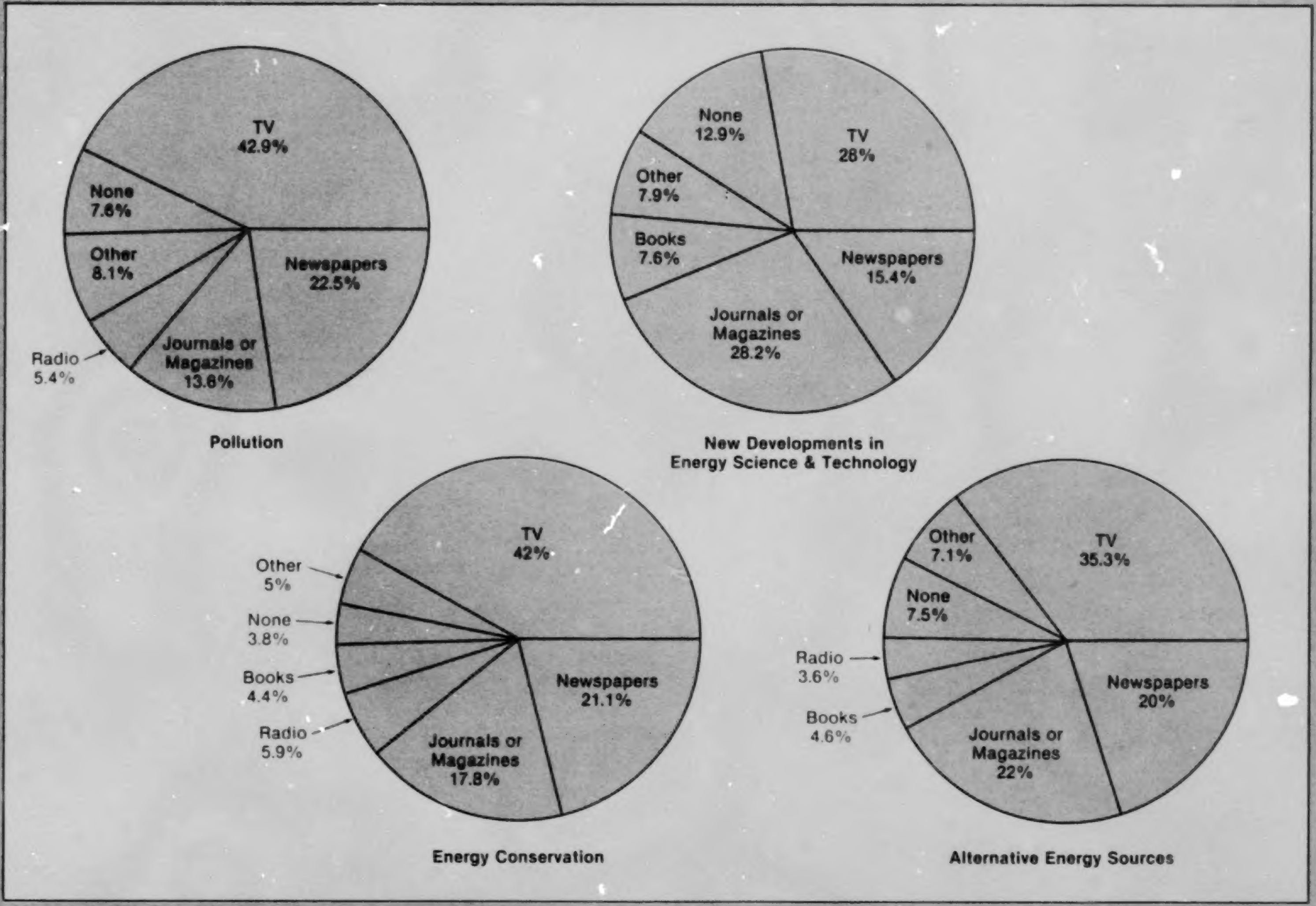
Table II-5: Circulations of popular science magazines

Magazine	1969	1973	1976	1979 (June)
National Geographic	6,402,674	8,276,668	9,350,123	10,249,748
Science	146,898	139,785	142,635	151,488
Science Digest	147,000	156,000	144,000	153,000
Science News	113,927	94,923	134,283	168,248
Scientific American	427,653	425,000	665,395	691,922

Sources: Circulation departments of each magazine.

Chart II-6: Sources used by young adults[1] to obtain information about selected energy issues

TV is the most frequently reported source of information about energy issues. For information about pollution, conservation, and alternative energy sources, TV provides information to nearly as many young adults as all the print media combined. For new developments in energy science and technology, however, young adults tend to use the print media.



[1] Defined as 26-35 years old.

Source: National Assessment of Educational Progress, *Energy Knowledge and Attitudes: A National Assessment of Energy Awareness Among Young Adults*, p. 38.

Chart II-7: Mean number of years of study, by subject of college-bound seniors, by sex, 1980-81

College-bound seniors continue to show the standard course preparation: 4 years of English, 3+ of mathematics, 2 of a foreign language, 1+ of biology, 1-2 of a physical sciences, and 3+ of social studies. The greatest inter-sex differences appear in the physical sciences and mathematics where the males take more course work.

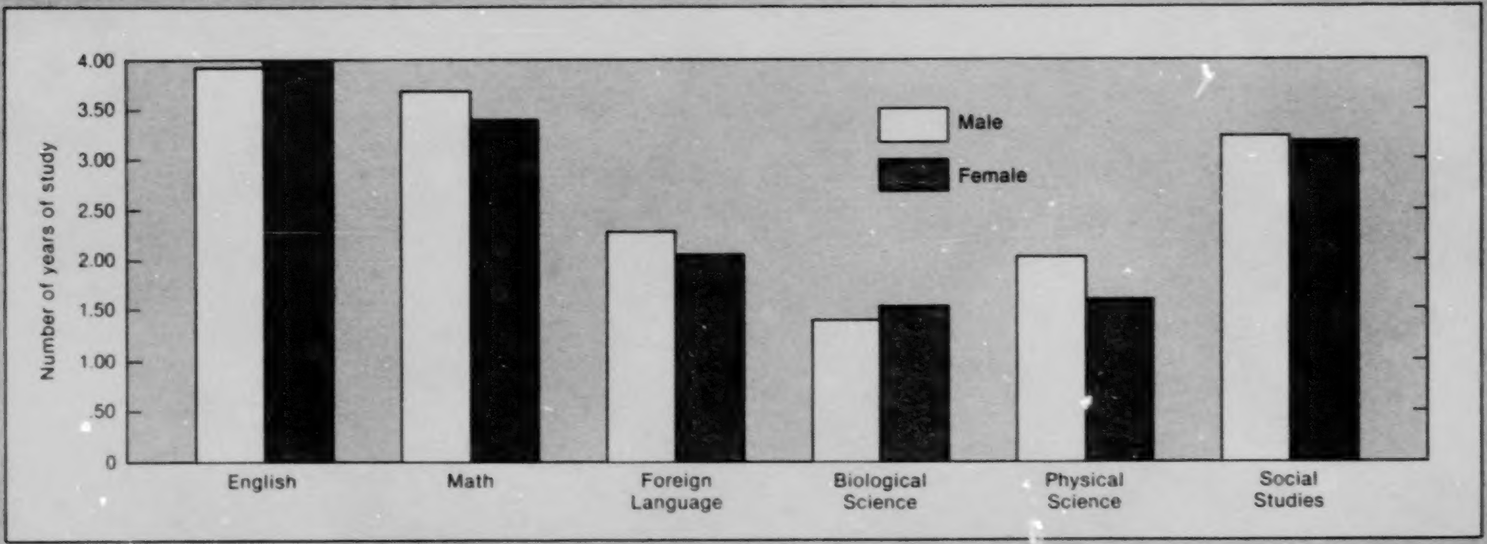


Table II-7: Number of years of study by subject of college-bound seniors, by sex, 1980-81

	English		Mathematics		For. Languages		Bio. Sciences*		Phy. Sciences*		Soc. Studies*	
	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %
No Courses	0.3	0.2	0.3	0.4	16.2	11.3	5.7	4.4	6.4	11.4	0.7	0.6
One Year	1.1	0.8	1.5	2.4	14.1	12.9	61.1	60.3	26.2	38.1	2.3	2.3
Two Years	1.6	1.1	8.3	14.8	36.8	34.2	25.3	27.8	36.1	33.8	16.4	17.8
Three Years	6.1	5.5	22.5	31.9	18.9	21.4	5.2	5.2	24.4	13.7	39.0	41.5
Four Years	82.1	81.1	54.4	42.9	11.1	15.6	1.9	1.6	5.2	2.2	35.6	32.1
Five or More Yrs.	8.9	11.2	12.9	7.6	2.9	4.7	0.8	0.7	1.7	0.7	6.0	5.6
No. Responding .	438404	491554	438052	491151	434591	488328	435997	489320	435359	487357	435685	488695
Mean No. Yrs. . . .	3.95	4.00	3.68	3.38	2.03	2.31	1.39	1.41	2.01	1.59	3.24	3.19
Mean No. (Total) .	3.98		3.52		2.18		1.40		1.79		3.22	

*Students were given examples of science and social studies courses as follows: biological sciences — "biology, botany, and zoology," physical sciences — "chemistry, physics, and earth sciences," social studies — "history, government, and geography." It is not clear where, if at all, students would note course-taking in physical or general science, anthropology, economics, sociology, or psychology.

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1981*, p. 14.

Chart II-8: Percent of college-bound seniors who took an honors course, by subject, 1980-81

The percentage of students taking honors courses from among those who reported subject courses on the Student Descriptive Questionnaire of the Admissions Testing Program included 9.0% for social studies, 14.0% for mathematics and over 9.0% for physical and biological sciences.

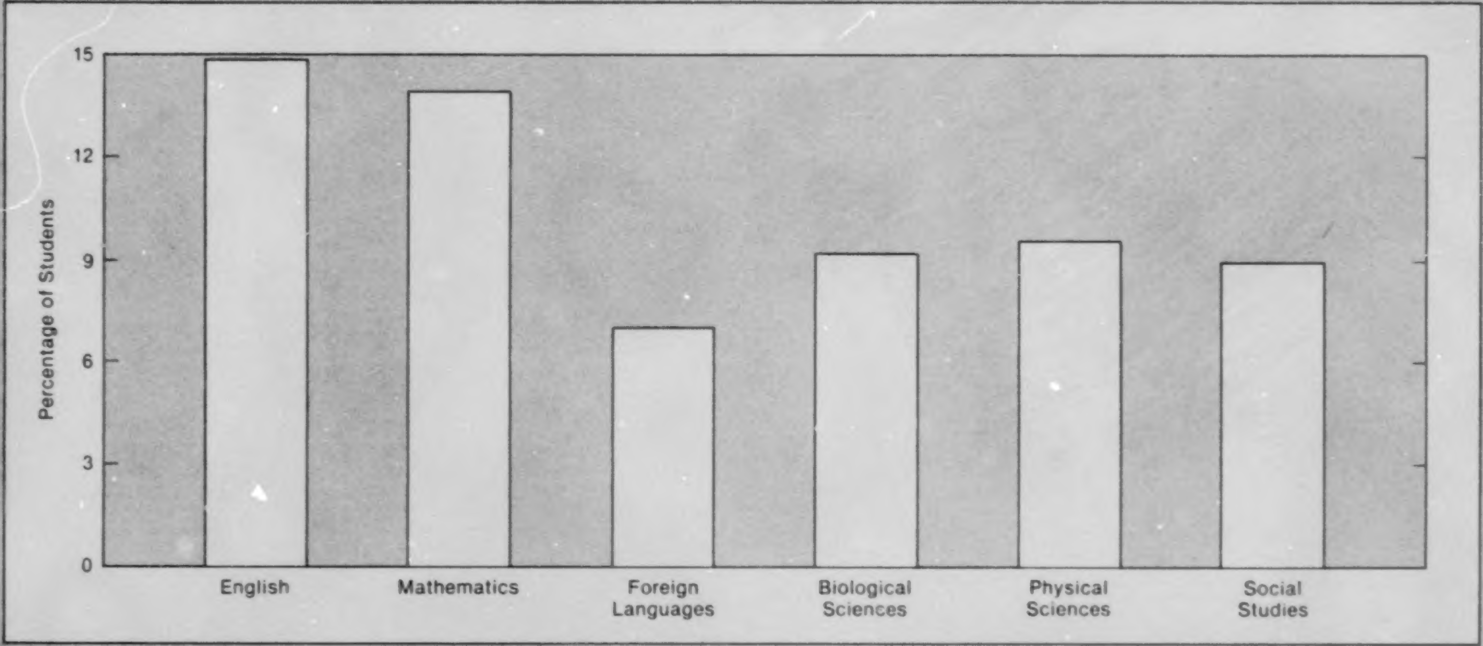


Table II-8: Number and percent of college-bound seniors who took an honors course, by subject, 1980-81

Honors Courses:	English	Mathematics	Foreign Languages	Biological Sciences	Physical Sciences	Social Studies
Number Who Took an Honors Course, by Subject	136,706	129,565	56,930	81,747	80,476	82,598
Number Who Took a Regular Course, by Subject	788,944	795,632	753,611	803,639	754,843	838,485
Total	925,650	925,197	810,541	885,386	835,319	921,083
Percent Who Took Honors Courses	14.8	14.0	7.0	9.2	9.6	9.0

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1981*, p. 21.

Chart II-9: Percent of high school seniors taking mathematics by sex, 1980

The total percent of students taking various mathematics courses declines in advanced course areas.

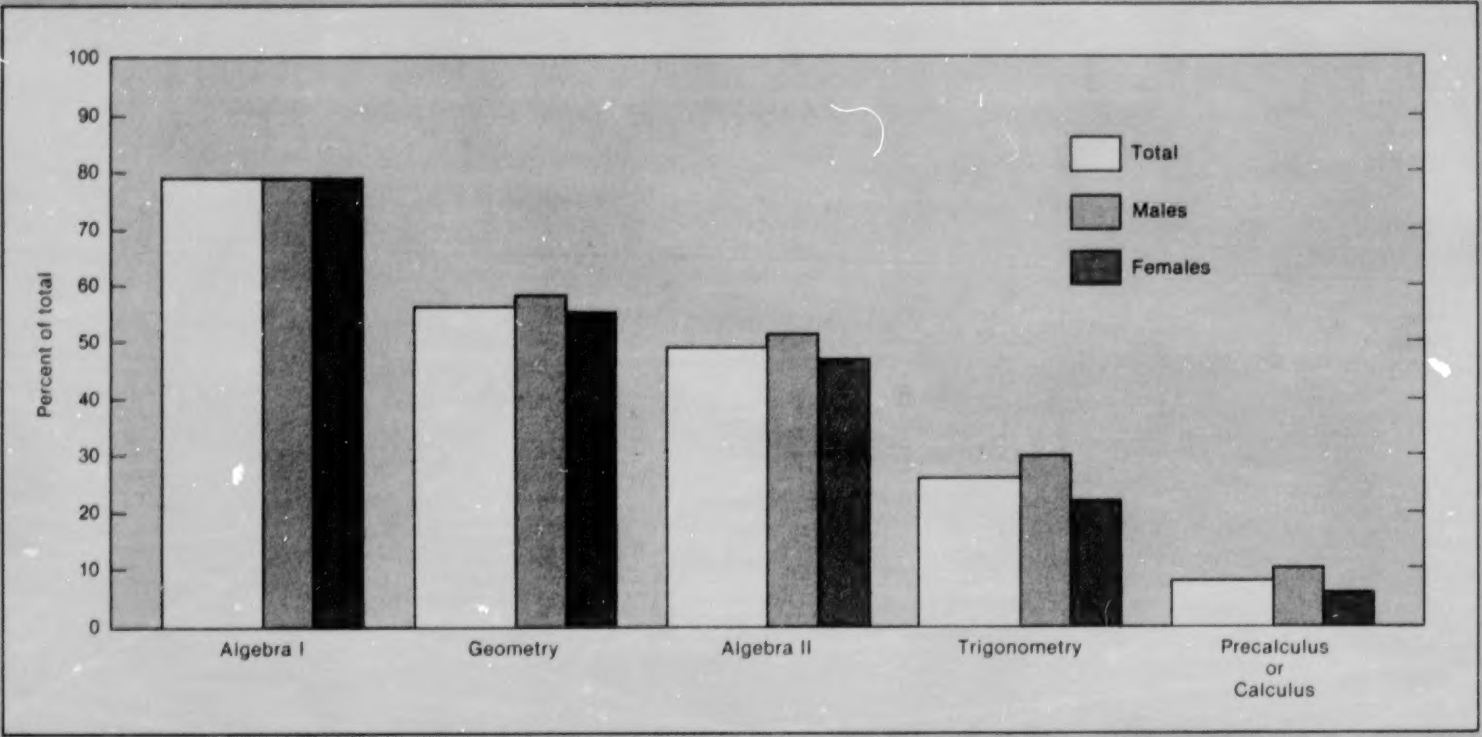


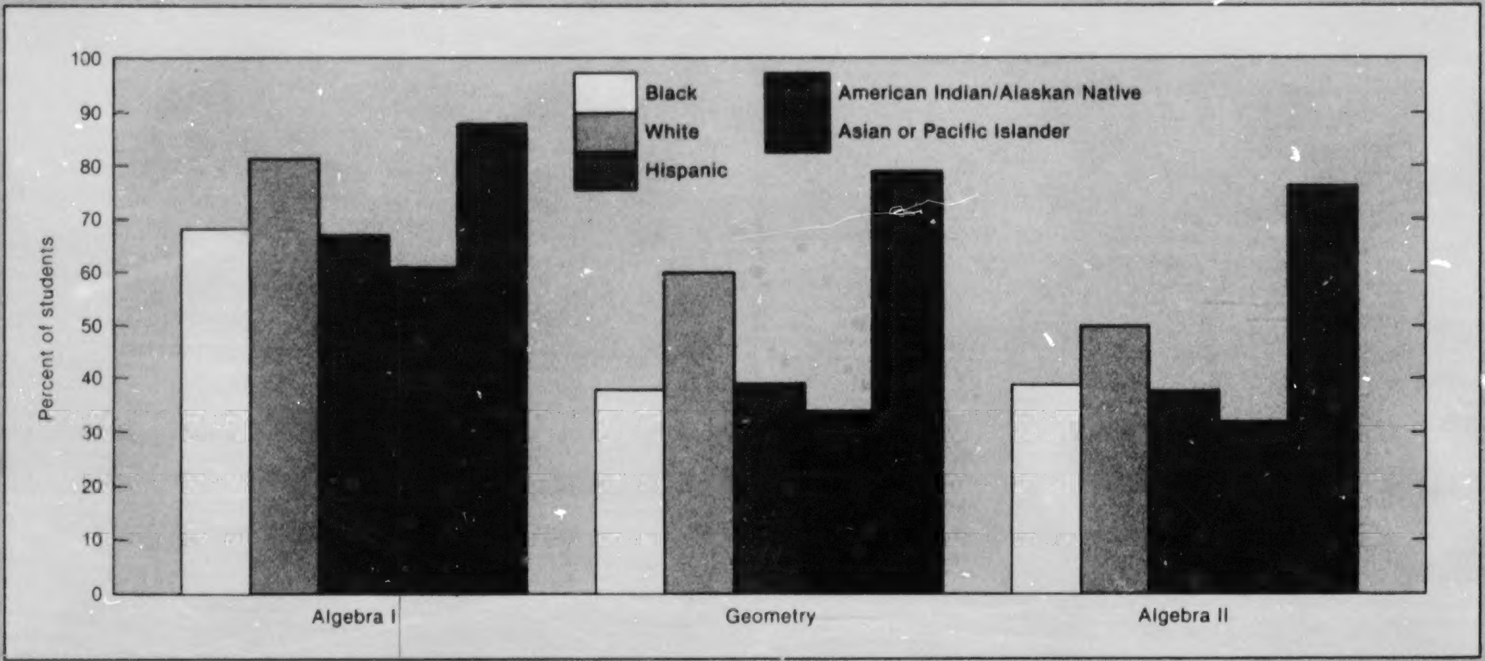
Table II-9: Percent of high school seniors taking mathematics, by sex, 1980

	Algebra I	Geometry	Algebra II	Trigonometry	Precalculus or Calculus
% of all Seniors	79	56	49	26	8
% Males	79	58	51	30	10
% Females	79	55	47	22	6

Source: High School and Beyond: a national longitudinal study for the 1980's. A Capsule Description of High School Students, page 5.

Chart II-10: Percent of 1980 high school seniors taking mathematics courses, by course title and racial/ethnic group

A substantially large percent of Asian or Pacific Islander seniors take algebra I & II, and geometry.



Source: *High School and Beyond — A National Longitudinal Study for the 1980's*, p. 5.

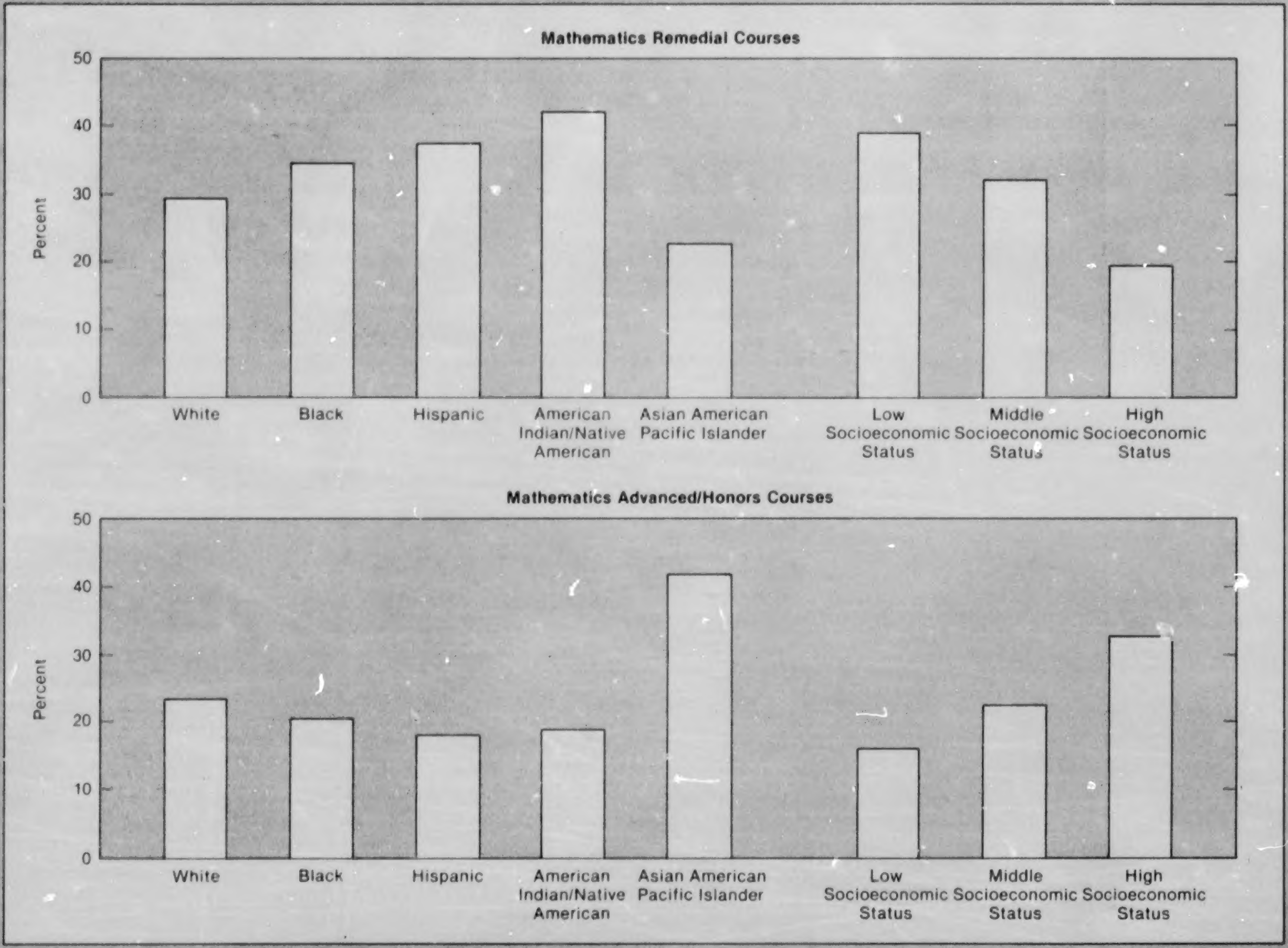
Table II-10: Percent of 1980 high school seniors taking mathematics courses, by course title and racial/ethnic group

	Algebra I	Geometry	Algebra II
Black	68	38	39
White	81	60	50
Hispanic	67	39	38
Amer. Indian/ Alaskan Nat.	61	34	32
Asian or Pacific Islander	88	79	76

Source: *High School and Beyond — A National Longitudinal Study for the 1980's*, p. 5.

Chart II-11: Remedial and advanced courses in mathematics taken by high school seniors

Black, Hispanic, and American Indian seniors were significantly more likely than whites to have taken remedial mathematics courses, while Asian/Pacific Islanders were less likely to have taken such courses. The higher the socioeconomic background, the less likely a student had taken remedial courses and the more likely a student had taken advanced or honors courses.



Mathematics Remedial Courses

Mathematics Advanced/Honors Courses

Source: *The Condition of Education*, NCES, 1982, p. 79.

Table II-11: Remedial and advanced courses in mathematics taken by high school sophomores and seniors, by race/ethnicity, sex, and socio-economic status: 1980

(Percent)

Student Characteristic	Remedial Mathematics	Advanced or Honors Mathematics
All Sophomores	34.2	24.2
Race/Ethnicity:		
White[1]	33.5	24.4
Black[1]	37.0*	21.8*
Hispanic	39.1*	19.9*
American Indian	45.4*	17.3
Asian/Pacific Islands	24.6*	39.7*
Sex:		
Male	35.8	25.1
Female	23.7**	23.4**
Socio-Economic Status:		
Low	41.0***	18.0***
Middle	35.3	23.3
High	24.9***	32.6***
All Seniors	30.0	23.0
Race/Ethnicity:		
White[1]	29.3	23.4
Black[1]	34.3*	20.3*
Hispanic	37.5*	18.0*
American Indian	41.9*	18.7
Asian/Pacific Islands	22.4*	41.9*
Sex:		
Male	31.7	25.5
Female	28.5**	20.8**
Socio-Economic Status:		
Low	39.0***	16.1***
Middle	30.9	22.3
High	19.6***	32.6***

*Represents significant difference from the white population at the .05 level.

**Represents significant difference from the male population at the .05 level.

***Represents significant difference from the middle socio-economic status population at the .05 level.

[1] Non-Hispanic.

Source: U.S. Department of Education, National Center for Education Statistics, unpublished tabulation from the High School and Beyond Survey.

Table II-12A: Total enrollment in higher education, by selected broad field, sex, and level of institution, 1978

	All Institutions			Universities			Other Four-Year Colleges			Two-Year Institutions		
Field	Total	Women	% W	Total	Women	% W	Total	Women	% W	Total	Women	% W
Agriculture/ Nat. Res.	146,772	42,560	29.0	90,530	27,520	30.4	35,768	9,804	27.4	20,474	5,236	25.6
Agriculture/ Env. Des.	66,371	17,398	26.2	42,508	11,458	27.0	15,430	4,173	27.0	8,433	1,767	20.9
Biological Sciences	301,868	133,330	44.2	115,035	45,509	39.6	164,031	75,735	46.2	22,802	12,086	53.0
Physical Sciences	164,413	40,447	24.6	72,187	15,097	20.9	76,861	19,387	25.2	15,266	5,963	39.1
Engineering	521,578	55,472	10.6	249,805	26,832	10.7	193,494	20,671	10.7	78,179	7,969	10.2
Business & Mgmt.	1,509,127	591,280	39.2	376,940	124,868	33.1	753,682	267,991	35.6	378,505	198,421	52.4
Dentistry	22,034	3,140	14.3	13,607	2,031	14.9	8,427	1,109	13.2	—	—	—
Medicine	67,280	15,674	23.3	31,404	7,536	24.1	36,951	8,154	22.1	—	—	—
Veterinary Med.	7,186	2,424	33.7	6,273	2,047	32.6	913	377	41.3	—	—	—
Law	119,120	36,251	30.4	68,812	21,631	31.4	50,186	14,592	29.1	122	28	23.0
All Other	8,465,301	4,756,223	56.2	1,737,163	977,761	56.3	3,186,766	1,845,663	57.9	3,541,376	1,932,799	54.6
Total Enrollments	11,391,050	5,694,199	50.0	2,804,014	1,262,317	45.0	4,522,609	2,267,656	50.1	4,064,157	2,164,269	53.3

Source: *Fall Enrollment — Higher Education, 1978*, National Center for Education Statistics, 1980

Table II-12B: Full-time graduate enrollment in doctorate institutions by race/ethnicity, 1979*

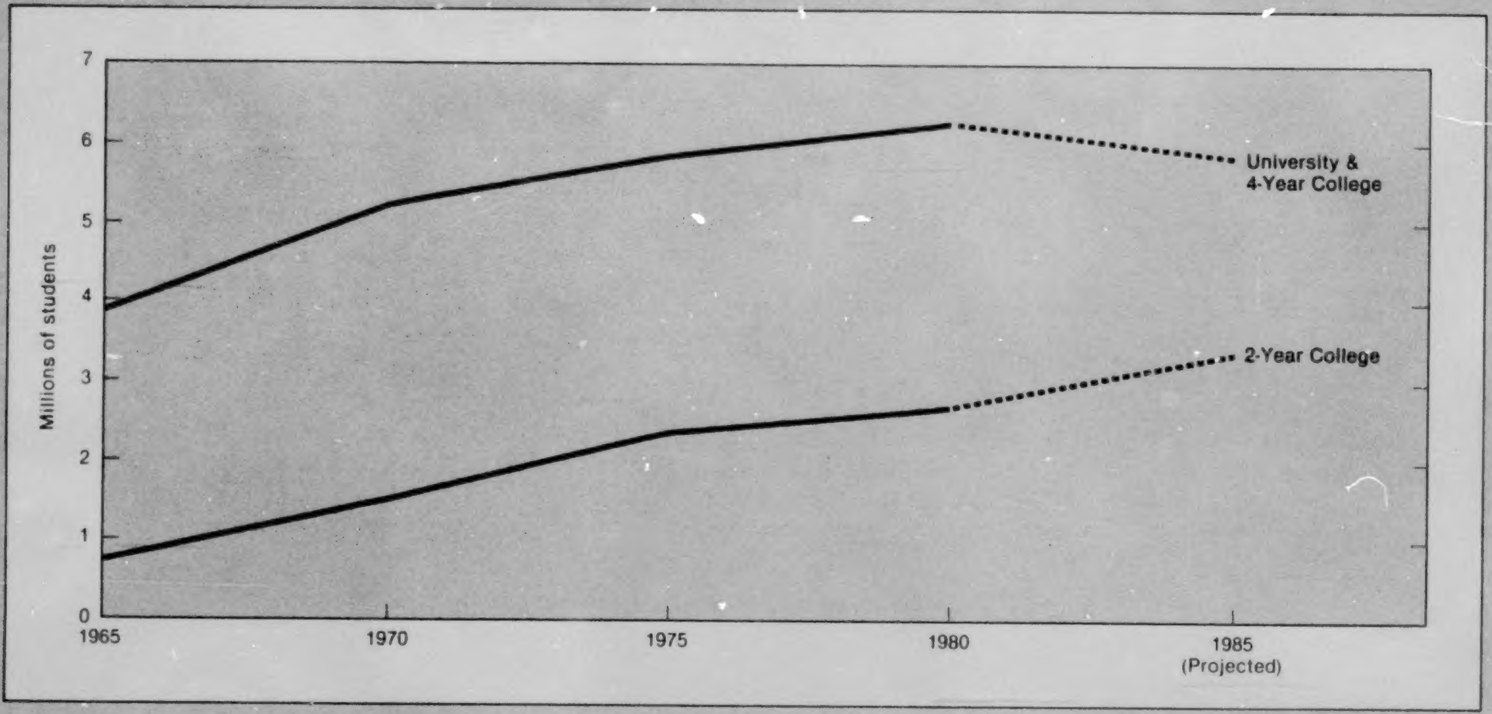
Percent Distribution

	Total	Black†	Am. Indian Alaskan	Asian/Pac. Islands	Hispanic	White†	Foreign
Total, All Fields	100.0	2.7	.2	1.8	1.9	74.0	19.5
Engineering	100.0	1.1		2.2	.9	52.7	43.0
Physical Sciences	100.0	1.3	.1	2.0	1.6	70.8	24.2
Environmental Sciences	100.0	.7	.1	1.1	1.3	83.5	13.4
Math/Computer Sciences	100.0	1.5	.1	1.9	1.4	65.0	30.2
Life Sciences	100.0	2.1	.2	2.0	1.8	81.8	12.2
Agricultural	100.0	.9	.1	.7	1.2	75.4	21.6
Biological	100.0	1.3	.1	2.3	1.6	83.3	11.4
Health	100.0	3.9	.4	2.1	2.3	82.6	8.7
Psychology	100.0	4.1	.2	1.6	2.8	88.2	3.0
Social Sciences	100.0	5.4	.4	1.3	2.7	73.3	16.9

*In 3,953 responding departments
†Non-Hispanic
Source: National Science Foundation, unpublished data.

Chart II-12: Full-time equivalent enrollments in all higher education

Since 1965, full-time-equivalent (FTE) enrollments in higher education have grown by 100%. The two-year college share of this enrollment has increased from 17% to 34%, but more than half of the TYC enrollment is in nondegree-credit occupational/technical programs. Current projections suggest levelling off and modest decline in total enrollments for higher education during the next decade.



Source: *Projections of Education Statistics to 1986-87.*

Chart II-13: Enrollments in two-year colleges, by sex and by field, fall 1978

Less than 4% of two-year institution students declare a major in agriculture/natural resources, biological sciences, engineering, or physical sciences. Within the 4%, women in two-year institutions exhibit the same pattern as those in four-year institutions and graduate school. They are most concentrated in the biological sciences, over 50% of the total, and least represented in engineering, about 11% of the total.

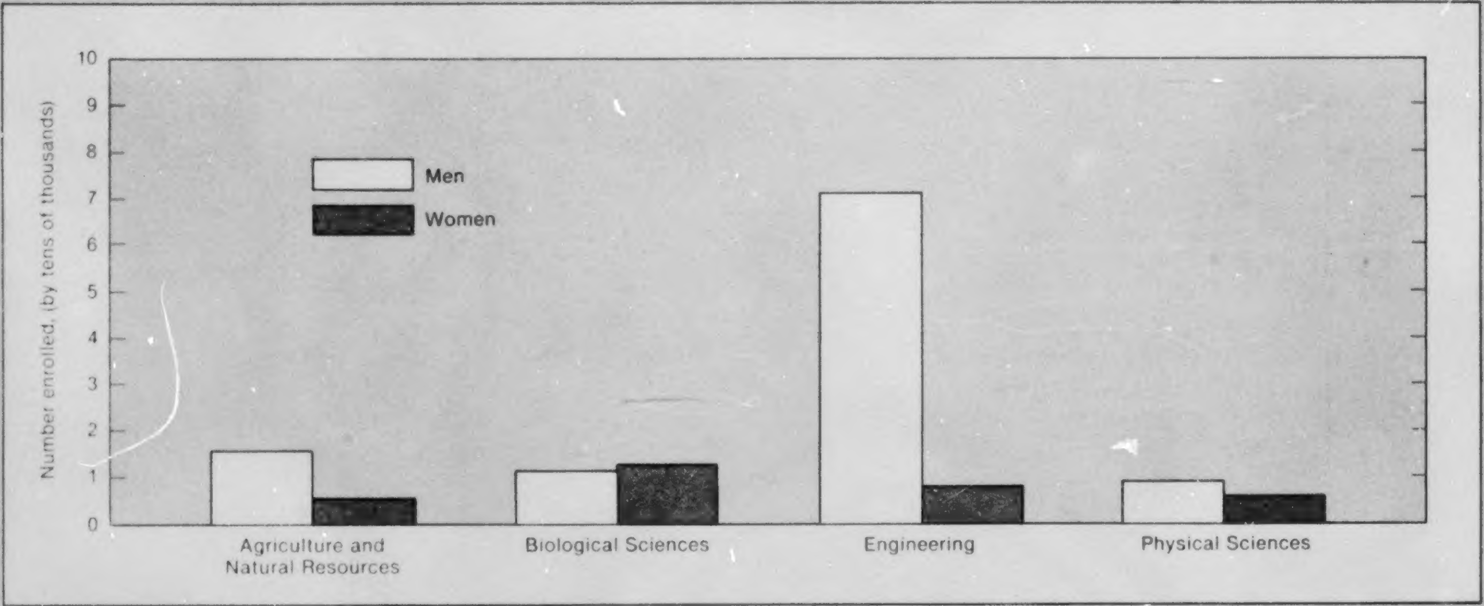


Table II-13: Enrollments in two-year colleges, by sex, and by field, fall 1978

Field	Male	Female
Agriculture and Natural Resources	15,238	5,236
Biological Sciences	10,716	12,086
Engineering	70,210	7,969
Physical Sciences	9,303	5,963
All Others	1,795,421	2,133,015
Total by sex	1,900,888	2,164,269
Total Enrollment	4,065,157	

Source: Pepin, Andrew J., *Fall Enrollment in Higher Education, 1978, (to be published).*

Table II-13A: Probable majors of entering freshmen in higher education (percent of all freshmen)

From 1975 to 1980 student choices of academic major shifted toward business, engineering, and computer sciences and away from the physical sciences, arts and humanities, and education. Since 1966, the number of entering freshmen planning a major in mathematics has dropped from 4.5% to .6% of the total.

Subject Areas	1966	1970	1975	1980
Biological Sciences	10.9	12.9	17.5	17.8
Business	14.3	16.2	18.9	23.9
Education	10.6	11.6	9.9	7.7
Engineering	9.8	8.6	7.9	11.8
Humanities and Arts	24.3	21.1	12.8	8.9
Mathematics and Statistics	4.5	3.2	1.1	0.6
Physical Science	3.3	2.3	2.7	2.0
Social Sciences	8.2	8.9	6.2	6.7
Other Technical*	2.2	3.7	8.6	8.2
Undecided and Other	11.8	11.6	14.5	12.4
Total Number of Full-Time Freshmen (in thousands)	1,163	1,617	1,761	1,712

*Includes computer science; in 1980, 4.9% of entering freshmen indicated a probable major in computer science, data processing, or computer programming.

Source: Astin, A. W., King, M. R., & Richardson, G. T. *The American Freshman: National Norms for Fall 1980*, and earlier editions of this report.

Table II-13B: Number of freshmen probable mathematical science majors in higher education (numbers of full-time freshmen)

Since 1970, the number of students planning to major in mathematics or statistics has declined by 80%. The number of students planning to major in computing has grown to over 84,000 in the same period.

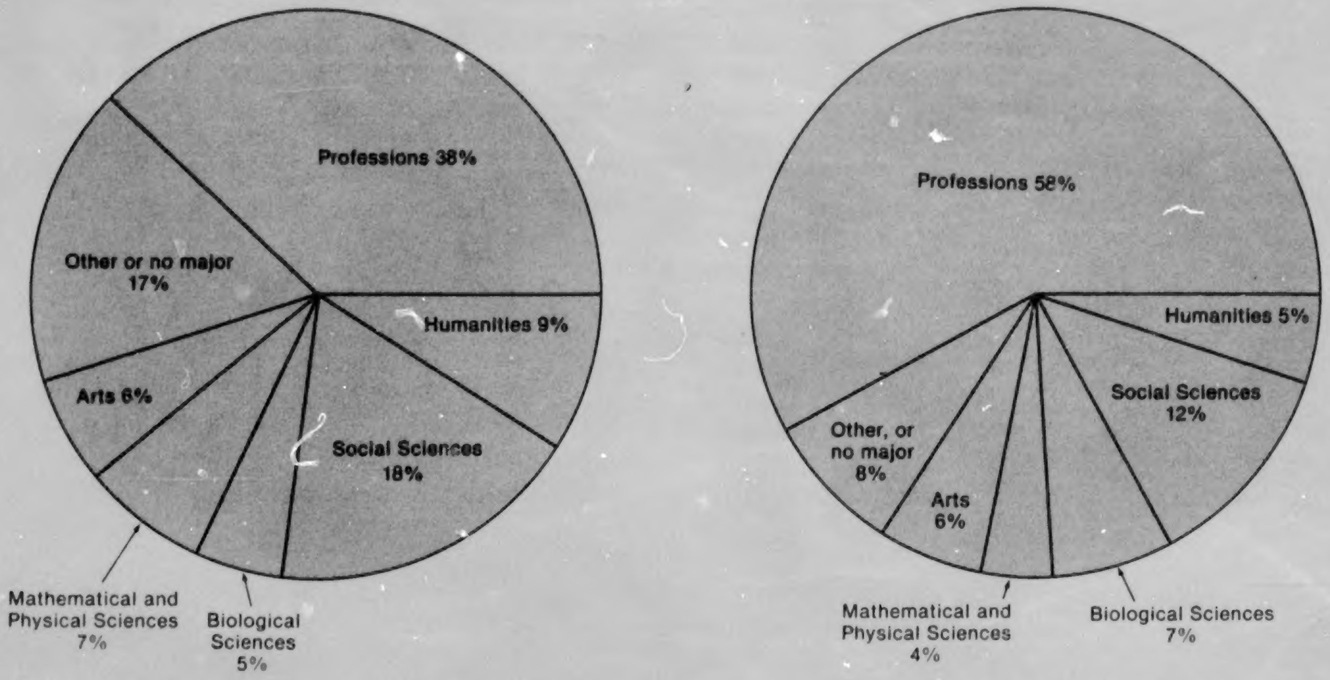
Institution Type	1970 Mathematics and Statistics	1975 Mathematics and Statistics	1980 Mathematics and Statistics	1980 Computing*
Universities	15,600	6,400	3,178	15,098
Four-Year Colleges	27,600	9,300	5,712	28,560
Two-Year Colleges	9,200	3,000	1,359	40,781
All Institutions	52,400	18,700	10,249	84,439

*Comparable data not available for earlier years.

Source: Astin, A. W., King, M. R., & Richardson, G. T. *The American Freshman: National Forms for Fall 1980* and earlier editions of this report.

Chart II-14: Percentages of undergraduate enrollments by field, 1969 and 1976

Although enrollment in biological sciences increased somewhat, mathematical, physical, and social sciences lost substantial portions of their enrollments. Professional subjects such as journalism gained considerable enrollments. Most of these changes were paralleled by faculty changes.



Undergraduate Enrollment 1969

Undergraduate Enrollment 1976

Source: Carnegie Foundation for the Advancement of Teaching, *Missions of the College Curriculum*, p. 103 (revised per advice of Carnegie Foundation).

Chart II-15: Trends in women's enrollment for master's & doctor's degrees, by field, 1969, 1972, 1976.

As a percentage of total enrollment, women show an increase in every field between 1969 and 1976.

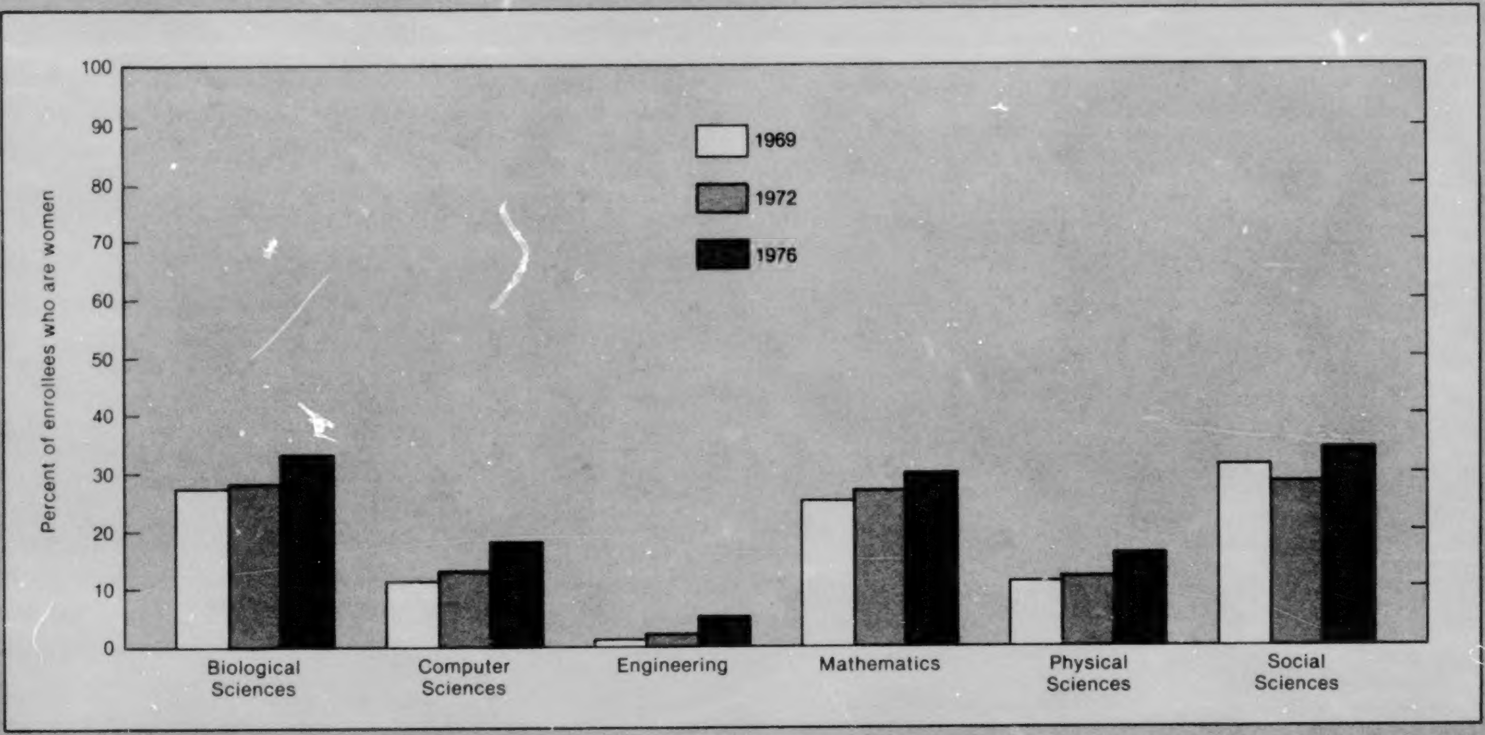


Table II-15: Trends in women's enrollment for master's and doctor's degrees, by field, 1969, 1972, 1976

	1969			1972			1976		
	Total	Women	%W	Total	Women	%W	Total	Women	%W
All Fields	756,865	264,266	35	858,580	326,675	38	1,030,007	451,594	43.8
Agriculture	6,908	476	7	11,322	942	8	15,206[2]	2,592[2]	17.0
Architecture	1,948	240	12	7,240	1,466	20	10,128[3]	2,774[3]	27.4
Biological Sciences	34,861	9,367	27	38,914	10,784	28	43,957	14,281	32.5
Business & Commerce	76,372	3,798	5	36,213	2,795	8	149,976	27,854	18.6
Computer Science & Systems Analysis	6,201	684	11	8,826	1,164	13	11,852	2,180	18.4
Education	234,042	128,617	55	275,053	159,683	58	324,475	209,129	64.5
Engineering	65,048	796	1	56,006	1,219	2	57,330	2,868	5.0
Fine & Applied Arts	26,614	12,481	47	24,890	11,713	47	30,222	15,995	52.9
Foreign Languages	20,721	11,755	57	16,796	10,029	60	12,808	8,255	64.5
Health Professions	12,564	5,372	43	23,692	12,172	51	38,101	24,534	64.4
Law	2,521	102	4	2,870	259	9	3,586	551	15.4
English Language & Literature	34,569[1]	18,932[1]	55	30,162	17,245	57	43,982	24,082	54.8
Library Science	12,092	9,633	80	12,756	9,969	78	13,307	10,628	79.9
Mathematics	22,974	5,639	25	19,238	5,101	27	14,926	4,442	29.8
Physical Sciences	39,885	4,240	11	36,047	4,374	12	36,147	5,661	15.7
Psychology	22,726	7,827	34	29,157	11,189	38	35,363	16,686	47.2
Social Sciences	90,569	28,274	31	73,207	20,686	28	67,128	22,916	34.1
Theology	10,765	1,799	17	10,334	1,757	17	16,791	3,484	20.7

Includes Journalism.
Includes Natural Resources.
Includes Environmental Design.
Source: Vetter, Betty M., *Professional Women and Minorities: A Manpower Data Resource Service*, Second Edition, 1978, p. 13.

Chart II-16: Undergraduate enrollments of women and minorities, by field, fall 1980

About 49% of the undergraduates enrolled in biology were women but only about 13% of the engineering enrollees were women.

Minority science enrollments ranged from 8% in agriculture and natural resources to 19% in biological sciences.

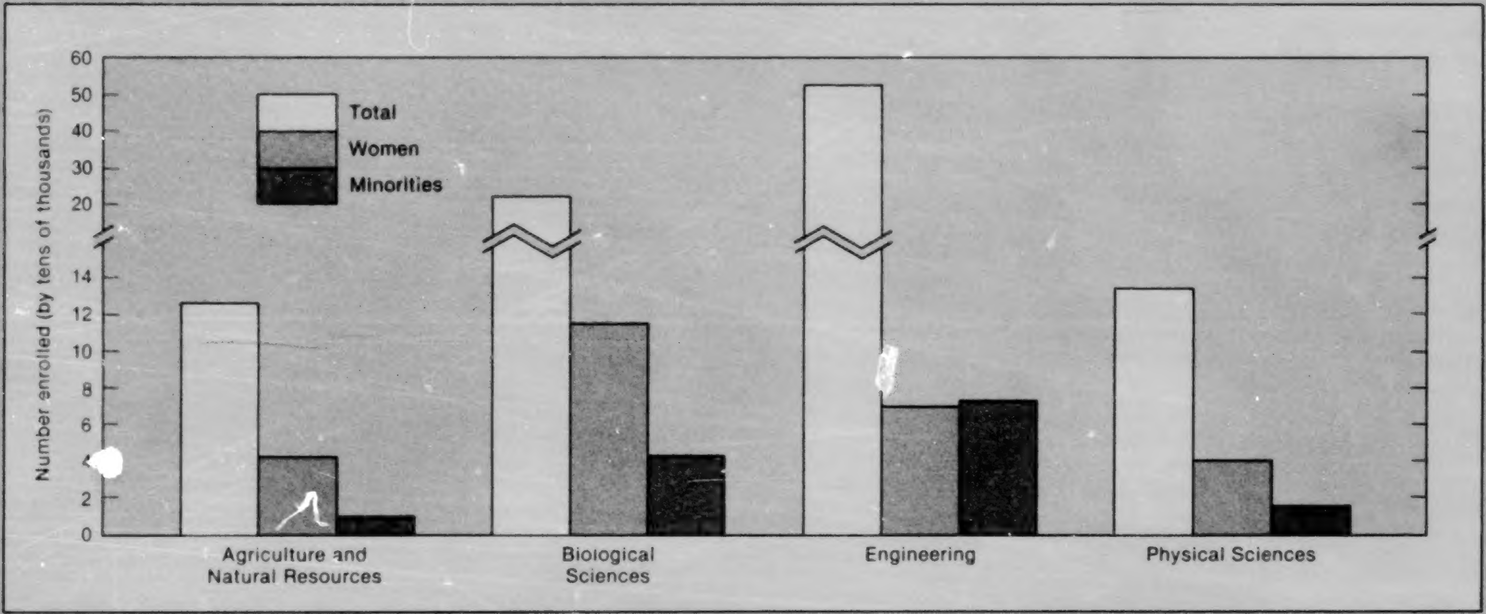


Table II-16: Undergraduate* enrollments of women and minorities, by field, fall 1980

Field	Total Enrollment	Women Number	Women Percent	Minorities** Number	Minorities** Percent
Agriculture and Natural Resources	125,102	40,941	33	9,451	8
Biological Sciences	233,293	114,839	49	43,787	19
Engineering	540,875	69,490	13	72,639	13
Physical Sciences	133,738	39,444	29	14,844	11

*Fulltime and part-time

**Includes: Black, Non-hispanic, American Indian/Alaskan native, Asian or Pacific Islander and Hispanic

Source: NCES (unpublished data).

Chart II-17: Graduate enrollments of women and minorities, by field, fall 1978

About 46% of all graduate students are women. Women's graduate enrollments are similar to women's undergraduate enrollments: high in biology (35%) and low in engineering (7%). About 10% of all graduate students are minorities. They comprise 5 to 8% of the enrollments in the fields shown.

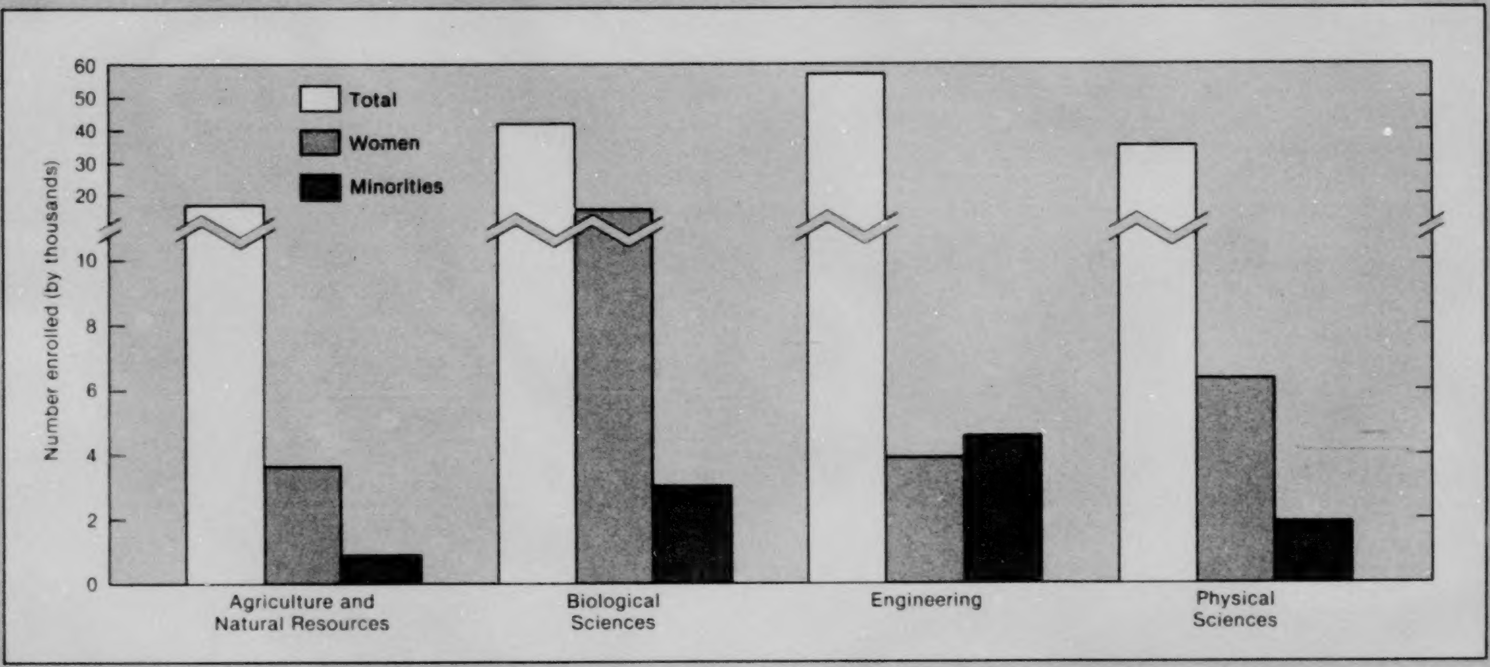


Table II-17: Graduate enrollments of women and minorities, by field, fall 1978

Field	Total Enrollment	Women number	Women percent	Minorities number	Minorities percent
Agriculture and Natural Resources	16,923	3,613	21	844	5
Biological Sciences	41,785	14,776	35	3,015	7
Engineering	57,123	3,984	7	4,523	8
Physical Sciences........	35,279	6,247	18	1,944	6
All Fields	1,076,795	498,995	46	111,625	10

Source: Pepin, Andrew J., *Fall Enrollment in Higher Education 1978* (to be published).

Chart II-18: Total engineering enrollments in engineering schools, 1968-1980

Undergraduate engineering enrollments continue to rise significantly.

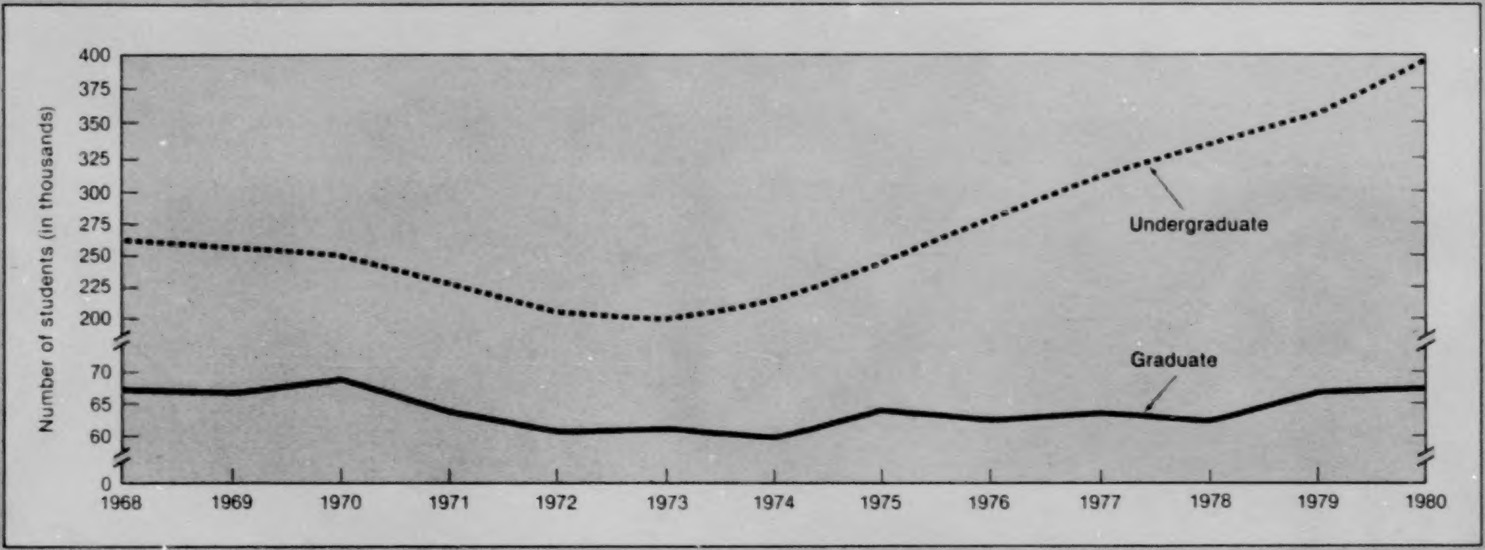


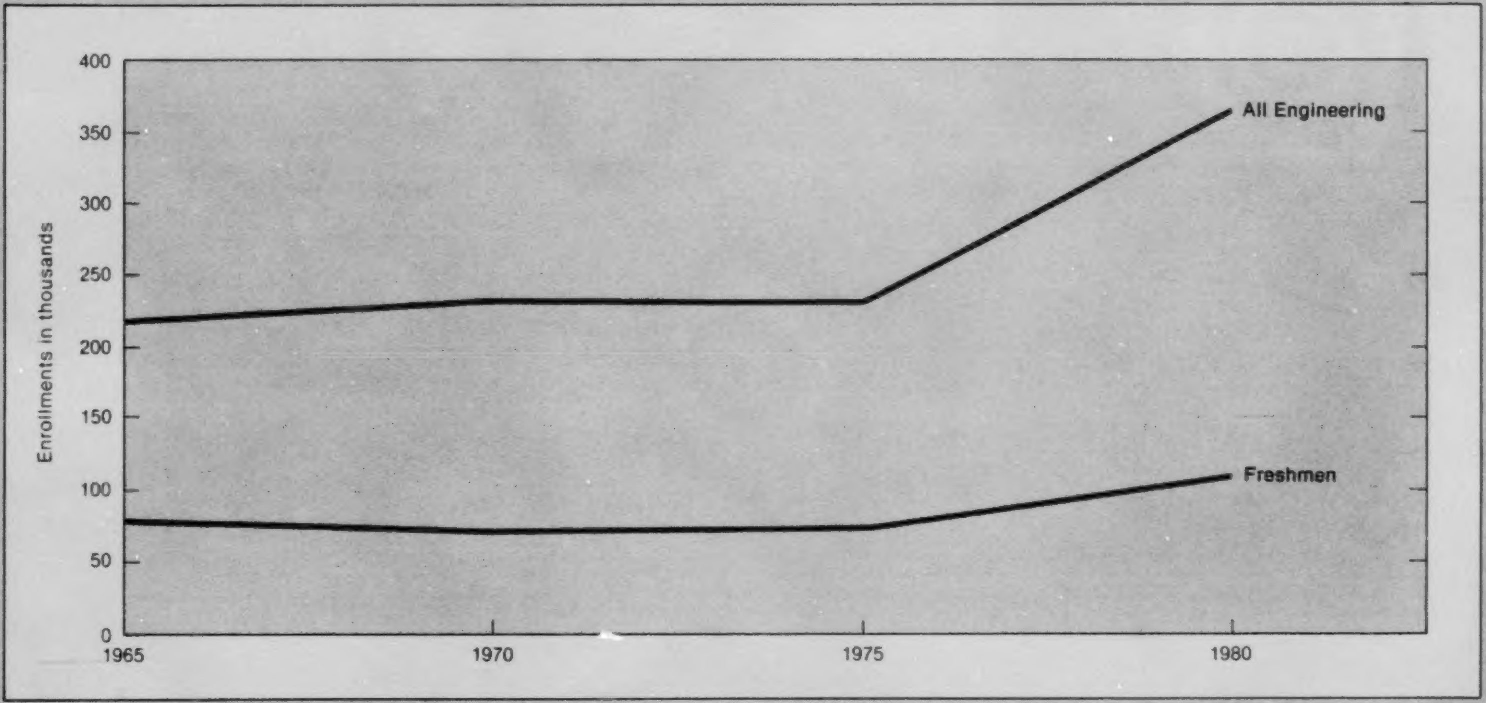
Table II-18: Total engineering enrollments in engineering schools, 1968-1980

Fall	Bachelors						Graduate Students	
					Total			
	First Year	Second Year	Third Year	Fourth/ Fifth Year	Full Time	Part Time	Full Time	Part Time
1969	74,113	52,972	50,039	56,406	233,530	20,984	34,312	32,645
1970	71,661	53,419	49,855	56,795	231,730	18,445	30,018	30,802
1971	58,566	47,948	48,543	55,768	210,825	18,222	36,505	27,302
1972	52,100	42,272	45,874	54,481	194,727	14,149	36,337	24,940
1973	51,929	40,519	41,673	52,588	186,705	15,692	34,492	26,114
1974	63,444	45,939	43,007	48,715	201,099	16,689	32,627	27,572
1975	75,343	55,891	49,338	50,807	231,379	17,041	37,285	21,173
1976	82,250	63,003	56,835	55,747	257,835	19,844	36,479	26,842
1977	88,780	70,326	64,721	65,421	289,248	20,634	39,235	25,055
1978	98,805	72,150	69,816	73,466	311,237	22,843	38,381	24,133
1979	103,724	78,594	74,928	83,242	340,488	25,811	41,384	25,768
1980	110,149	84,982	80,024	89,962	365,117	32,227	44,335	23,250

Source: Engineering and Technology Enrollments Series, 1969-1980, Engineering Manpower Commission.

Chart II-19: Full-time undergraduate engineering enrollments

From a relative minimum in 1973, undergraduate engineering enrollments have grown steadily to an all-time high of 365,000 in 1980. Since the number of freshman engineering students was also an all-time high in that year, the influence of engineering enrollments on mathematics course demand is likely to continue strong over the next several years.



Source: Engineering Manpower Commission. *Engineering and Technology Enrollments, Fall 1980.*

Table II-19: Full-time undergraduate engineering enrollments (enrollments in thousands)

	1965	1970	1975	1976	1977	1978	1979	1980
Freshmen	80	72	75	82	89	96	104	110
All Engineering	220	232	231	258	289	311	340	365

Source: Engineering Manpower Commission. *Engineering and Technology Enrollments, Fall 1980.*

Chart II-20: Total number of bachelors degrees in engineering granted to women, 1968-69 to 1980-81

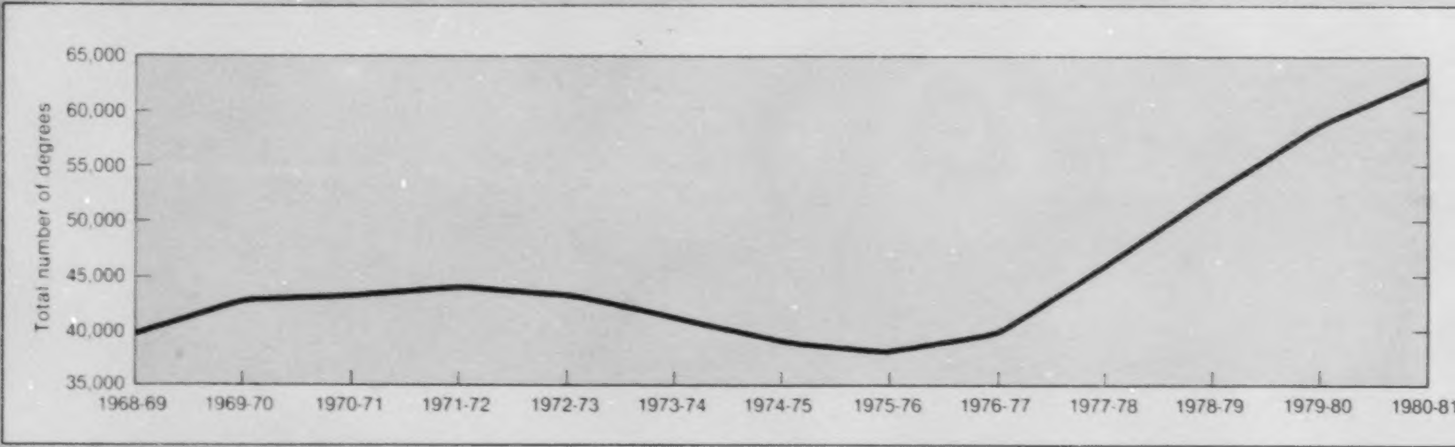


Chart II-21: Masters and doctors degrees in engineering granted to women, 1968-69 to 1980-81

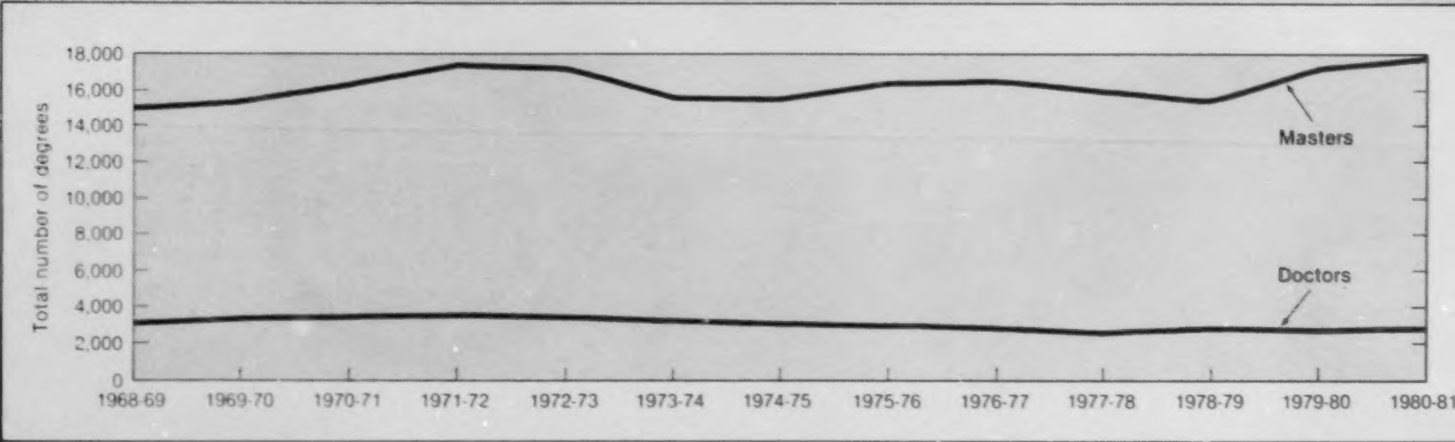


Table II-20: Engineering degrees granted to women by degree level, 1968-69 through 1979-80

Year	Bachelors			Masters†			Doctor's		
	Total	Women	% W	Total	Women	% W	Total	Women	□ W
1968-69*	39,972	328	0.82	14,980	107	0.71	3,387	23	0.68
1969-70*	42,966	358	0.83	15,548	170	1.09	3,620	16	0.44
1970-71*	43,167	353	0.82	16,383	158	0.96	3,640	25	0.69
1971-72	44,190	525	1.19	17,356	209	1.76	3,774	35	0.93
1972-73	43,429	624	1.44	17,152	226	1.32	3,587	48	1.34
1973-74	41,407	744	1.80	15,865	393	2.47	3,362	36	1.07
1974-75	38,210	878	2.30	15,773	380	2.41	3,039	53	1.74
1975-76	37,970	1,376	3.62	16,506	557	3.37	2,977	56	1.88
1976-77	40,095	1,961	4.89	16,551	646	3.90	2,814	67	2.38
1977-78	46,095	3,280	7.11	16,182	814	5.03	2,573	51	1.98
1978-79	52,598	4,716	8.97	15,624	866	5.54	2,815	61	2.17
1979-80	58,742	5,680	9.67	17,243	1,092	6.33	2,751	88	3.20
1980-81	62,935	6,545	10.40	17,914	1,225	6.90	2,841	90	3.20

†Includes Engineer Degrees

*Totals for women in these years include only numbers actually reported. The totals would be higher if all institutions had reported all categories. (Figures for later years are complete estimates.)

Source: *Engineering and Technology Degrees*, 1969 through 1980 series, Engineering Manpower Commission.

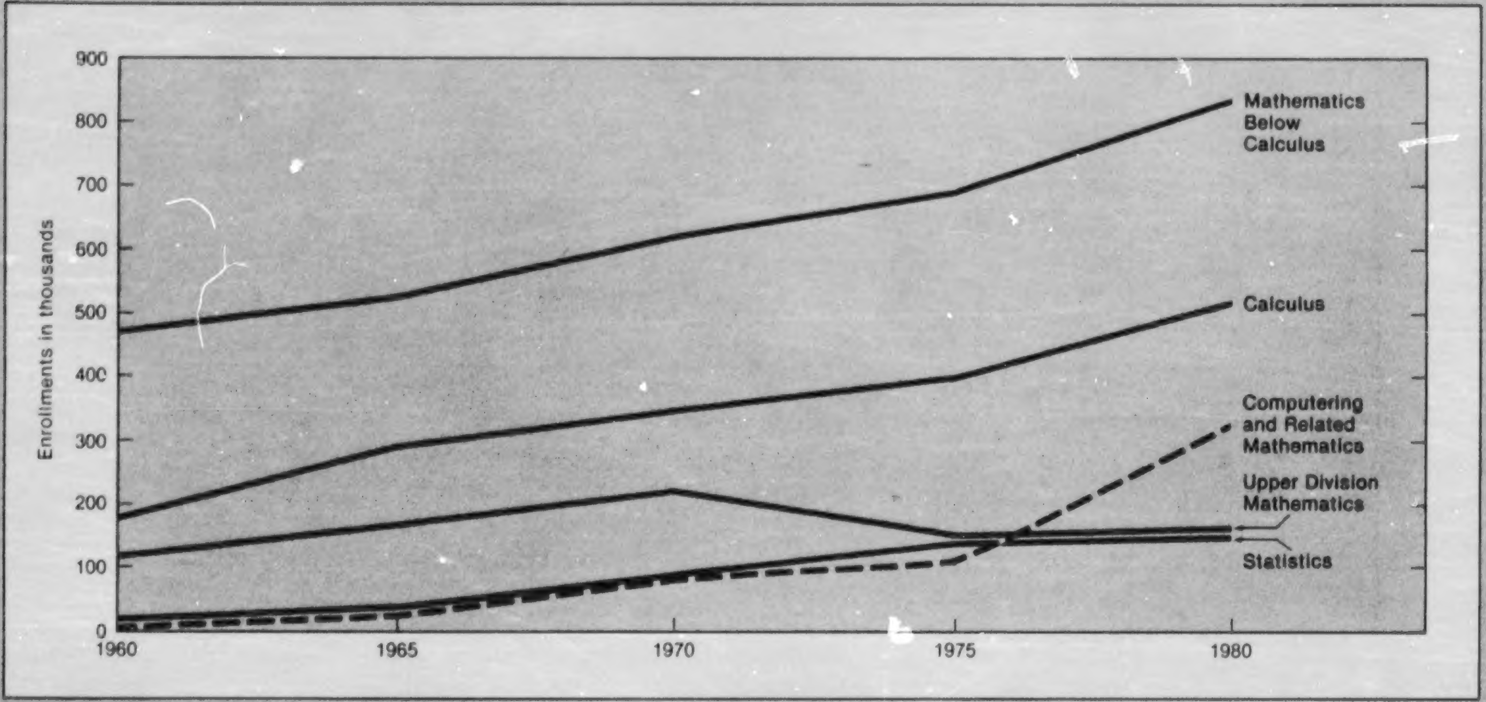
Table II-21: Engineering technology degrees awarded, by sex and level of degree, 1970-71 - 1979-80

	Bachelor's			Master's		
	Total Both Sexes	Women Only	% Women	Total Both Sexes	Women Only	% Women
1970-71	5,148	42	.80	134	—	0
1971-72	5,772	46	.80	237	1	0.42
1972-73	4,854	52	1.07	122	2	1.64
1973-74	7,456	105	1.40	209	9	4.30
1974-75	7,497	192	2.57	221	4	1.80
1975-76	7,943	165	2.07	328	14	4.26
1976-77	8,347	196	2.34	284	23	8.09
1977-78	8,787	246	2.80	360	25	6.94
1978-79	9,355	327	3.49	268	18	6.71
Total	65,159	1,371	2.10	2,163	96	4.44

Source: *Earned Degrees Conferred*, Series 1970-71, 1979-80, U.S. Office of Education, NCES.

Chart II-22: Mathematical science enrollments in universities and four-year colleges

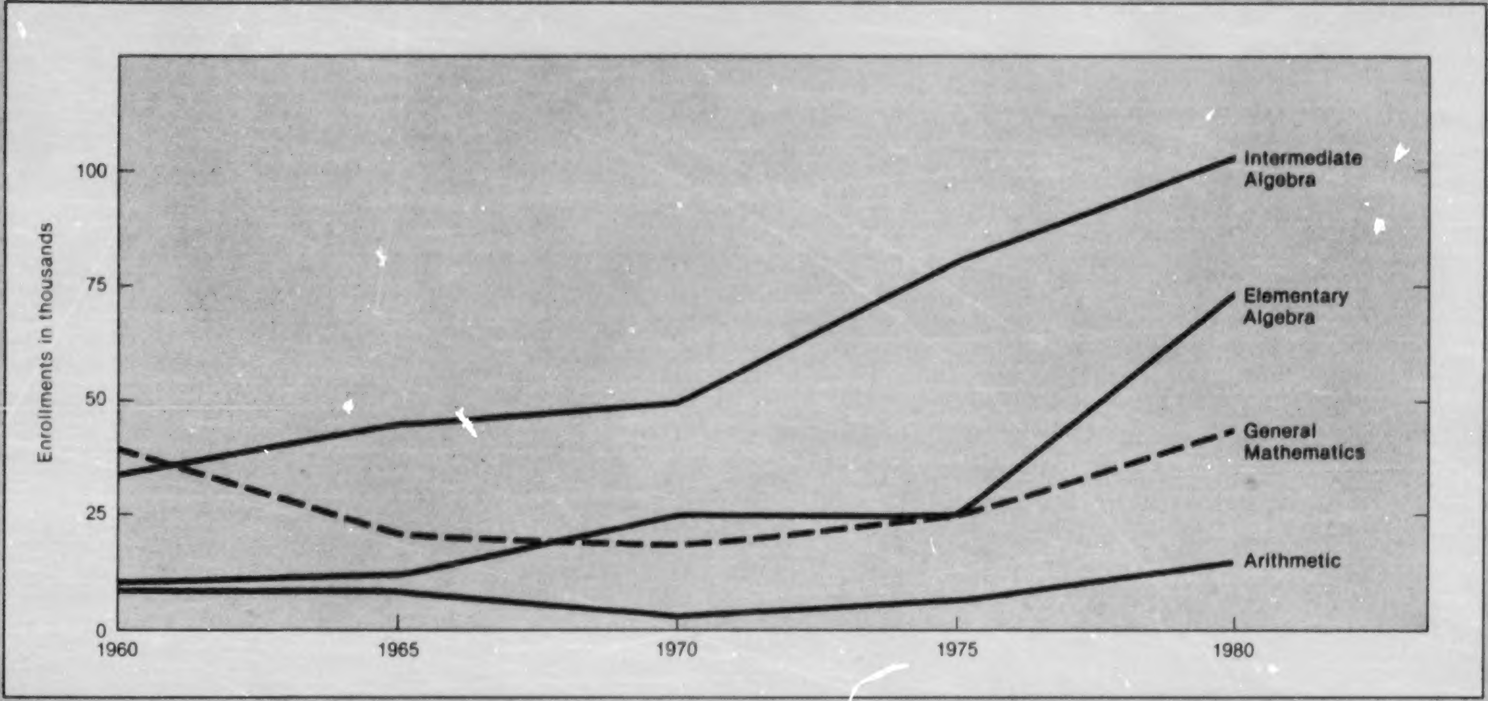
Between 1975 and 1980 all mathematical science enrollments increased by 33%, compared to 7% for FTE enrollments in all fields. The 30% increase in calculus and the 196% increase incomputing courses led the way.



Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Chart II-23: Remedial mathematics in universities and four-year colleges

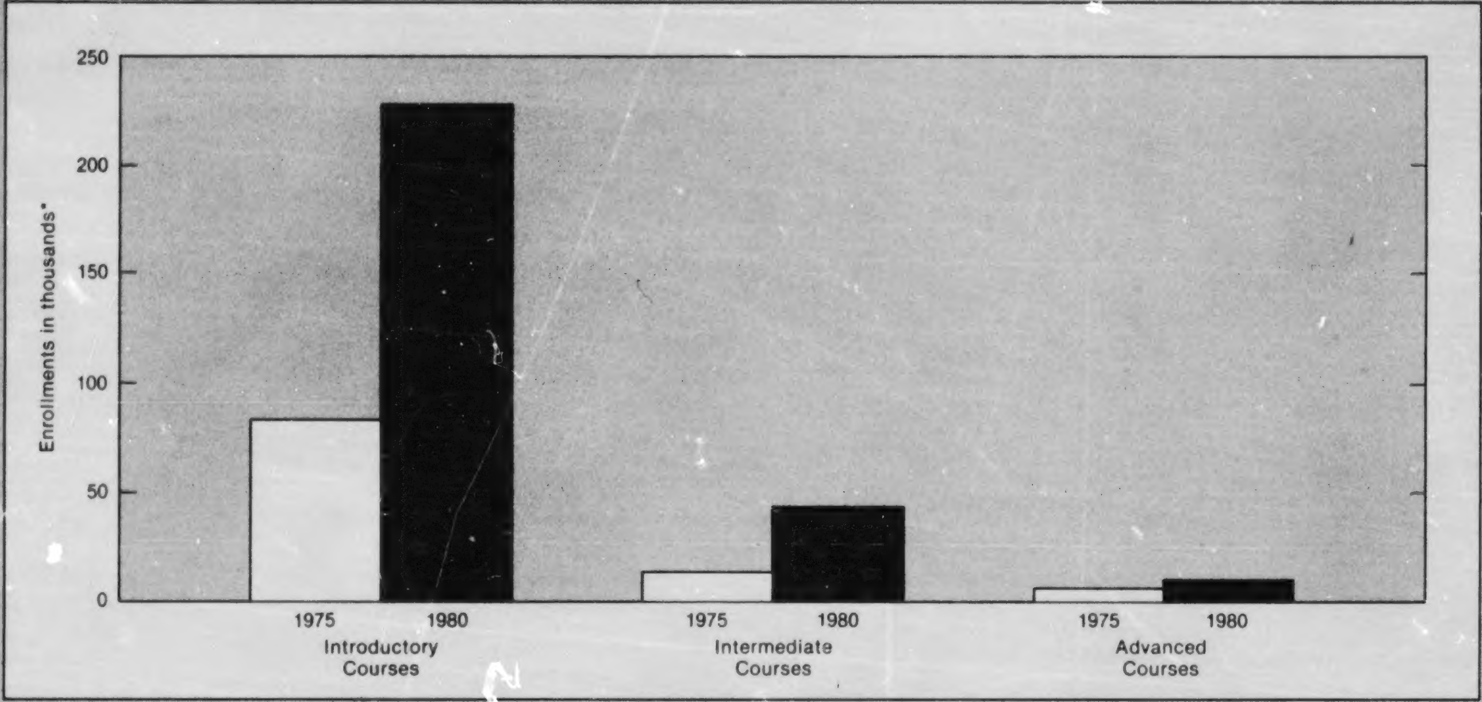
Since 1960, enrollment in remedial arithmetic, general mathematics, and algebra has increased by 165%. Those courses now constitute 16% of all mathematics enrollments, compared to 13% in 1960. The biggest increase occurred between 1975 and 1980, matching a period of widespread reports that high school preparation in mathematics has declined sharply.



Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Chart II-24: Computer science enrollments in universities and four-year colleges

Computer science courses now generate over 16% of all mathematical science enrollments and they are increasingly given by separate departments of computer science. As in mathematics and statistics, the largest share of computer science enrollment is in lower level courses.



*Includes only enrollments in mathematical science departments (including computer science departments). In the 160 universities there are an estimated 94 separate departments of computer science. There are an estimated 85 computer science departments in the 407 public colleges, and 48 computer science departments in the 830 private colleges. However, computer science courses are often taught by mathematics departments.

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Table II-24: Course enrollments in computer science at universities and four-year colleges (enrollments in thousands)

There was strong enrollment growth in nearly every computer science course offering. However, the bulk of the increase from 1975 to 1980 occurred in beginning programming courses. The new course "Computers and Society" established a substantial enrollment.

Subject	1975	1980
1. Computer Programing I (CSI)*	50	154
2. Computer Programming II (CS2)	13	32
3. Introduction to Computer Systems (CS3)	13	16
4. Discrete Structures	3	9
5. Computer Organization (CS4)	3	12
6. File Processing (CS5)	3	7
7. Operating Systems and Computer Architecture (CS6)	2	7
8. Data Structures and Algorithm Analysis (CS7)	3	12
9. Organization of Programming Languages (CS8)	7	6
10. Computers and Society (CS9)	NA	16
11. Operating Systems and Computer Architecture II (CS10)	NA	2
12. Database Management Systems Design (CS11)	1	4
13. Artificial Intelligence (CS12)	1	1
14. Algorithms (CS13)	1	2
15. Software Design and Development (CS14)	NA	2
16. Theory of Programming Languages (CS15)	NA	1
17. Automata, Computability, and Formal Languages (CS16)	1	2
18. Numerical Mathematics (CS17, 18)	1	6
19. Other Computer Science	5	30
Totals	107	321

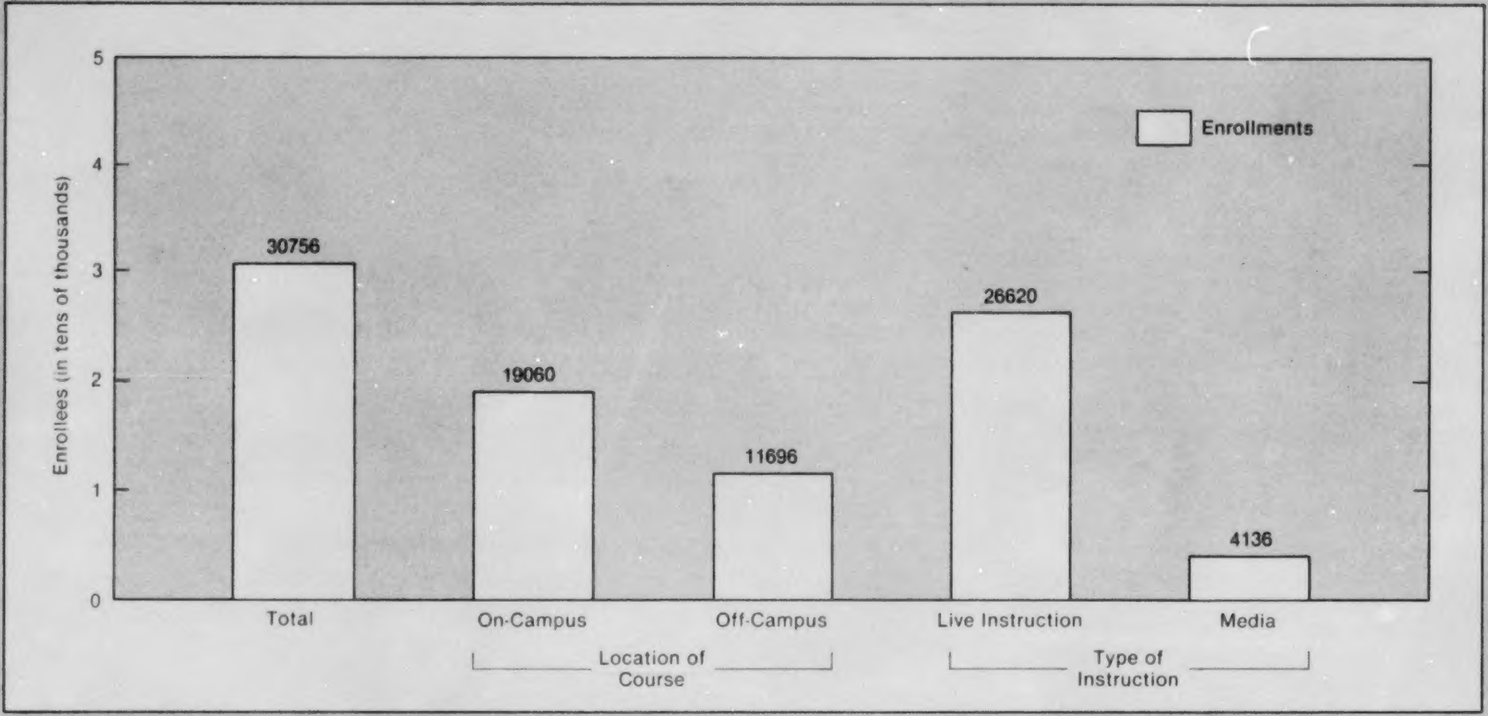
*CS numbers refer to courses described in Curriculum '78, *Communications of the Association for Computing Machinery*, 1979, 22(3), 147-166.

Enrollments are only those reported by mathematical science departments, thus not including computer programming taught by a business or engineering school, for example.

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendel H. Fleming. Conference Board on Mathematical Science, 1981.

Chart II-25: Enrollments in continuing education degree credit courses by scientists and engineers, 1975-76

In 1975-76, over 30,000 scientists and engineers enrolled in degree credit courses offering an average of 3 hours credit. About two-thirds of the enrollments occurred in on-campus courses and one-third off-campus. Comparing this chart with chart I-18, we can see that the average course had an enrollment of approximately nine students. Furthermore, while there were more off-campus activities, attendance was much greater for the on-campus activities.



Source: Klus, John P. and Jones, Judy A., *Survey of Continuing Education Activities for Engineers and Scientists*, pp. 15-17.

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Chart II-26: Enrollments in continuing education non-credit activities by scientists and engineers, 1975-76

Almost 187,000 scientists and engineers enrolled in continuing education non-credit activities in 1975-76. About 60% of the enrollments took place in university-sponsored activities and 40% with professional societies. Comparing this chart with chart I-19 we can see that while universities offered roughly three times as many activities as the professional associations they attracted only one and one-half times as many enrollees.

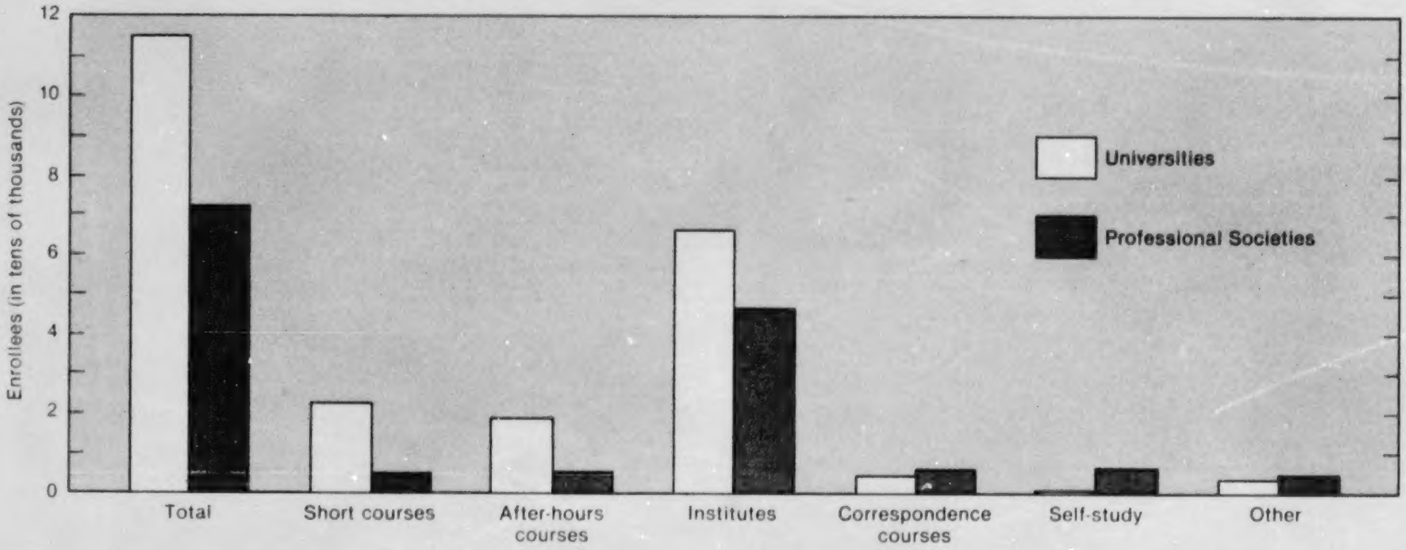


Table II-26: Enrollments in continuing education non-credit activities by scientists and engineers, by type of activity and institution offering activity, 1975-76

Type of Institution	Number with One or More Activities	Total Enrollments	Type of Activity*					
			Short Courses	After-hours Courses	Institutes	Correspondence Courses	Self-study	Other
Universities	92	114,688	22,190	18,705	65,893	4,481	175	3,244
Professional/Technical Organizations	55	71,904	4,918	5,288	46,523	4,583	5,812	4,780
Total	147	186,592	27,108	23,993	112,416	9,064	5,987	8,024

*See Table I-19 for definitions of activities.

Source: Klus, John P. and Jones, Judy A., *Survey of Continuing Education Activities for Engineers and Scientists*, pp. 6-15.

Chapter III
ATTITUDES, GOALS, AND NEEDS

INTRODUCTION

Resources and participation determine the form and content of American education. But knowing only that gives us an incomplete picture of our educational system, since that alone does not tell us how people feel about the system, what their educational aspirations are, or in what areas they feel the system needs improvement. Such data, generally termed affective, are crucial if we are to understand why our educational system is the way it is and which changes are most likely to occur.

Obtaining affective information regarding science and mathematics education exclusively is very difficult. National polls historically neglect to ask about attitudes towards science and mathematics education. Nevertheless, this chapter assembles a collection of data grouped according to three categories of belief holders (students, faculty, public), which is reasonably representative of people's attitudes, goals, and needs concerning science and mathematics education.

HIGHLIGHTS

Students

1. Students' attitudes toward school decline with increasing grade levels. (Chart III-1)
2. The popularity of science and social studies increases somewhat with students' ages, while the popularity of mathematics decreases. Even so, mathematics is more popular at all ages than either science or social studies. (Chart III-2)
3. About 41% of the college-bound seniors intend to study the physical sciences, social sciences, or psychology. (Chart III-3)
4. In the basic skills area, more college-bound seniors say they need help in mathematics than in reading and writing. (Chart III-4)
5. The proportion of teachers who would choose the teaching profession if they had a chance to start all over has declined since 1961. (Chart III-5)
6. Most teachers believe that salary, community attitudes, status and student attitudes have had a negative effect on job satisfaction. (Chart III-6)

Faculty

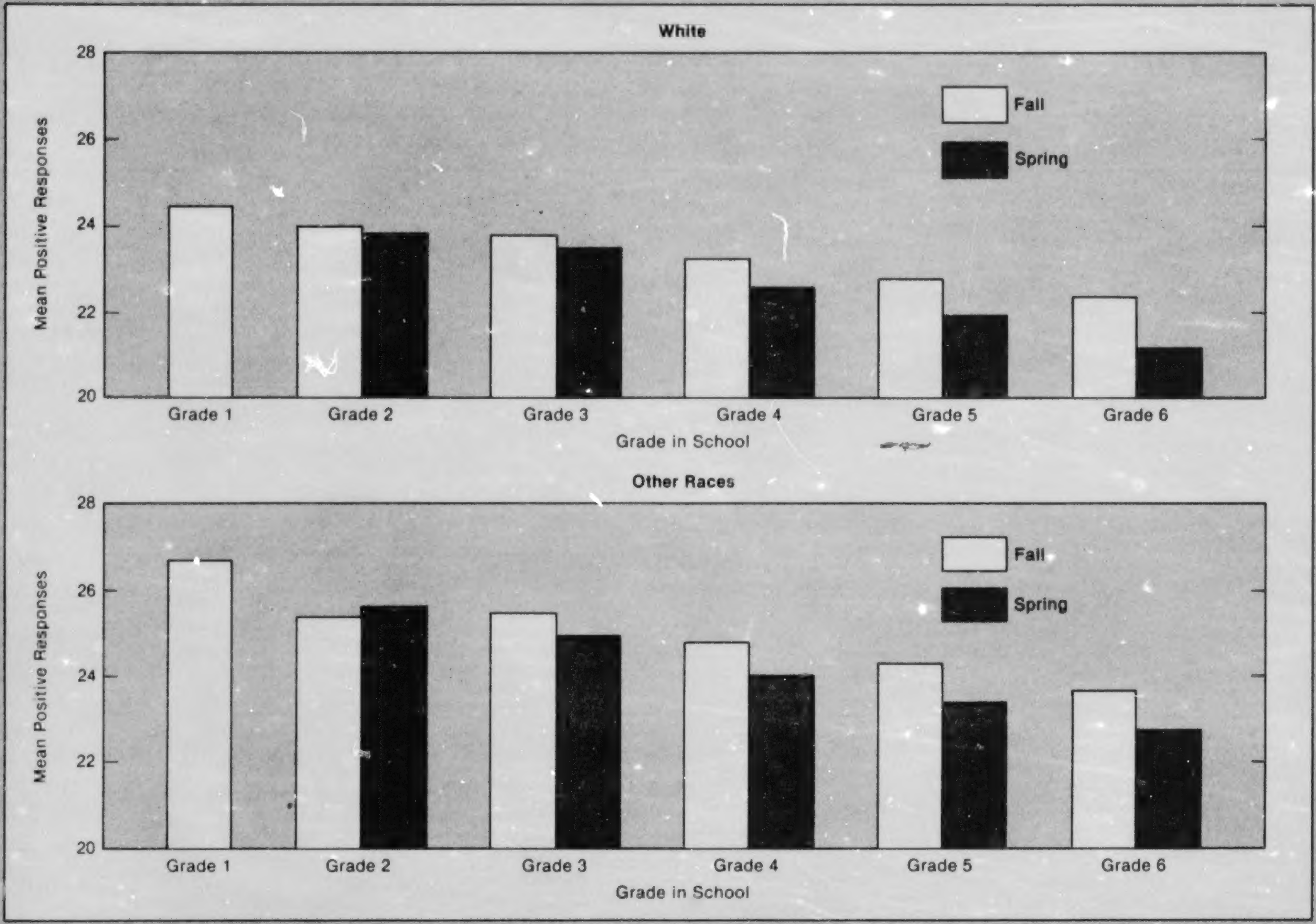
1. A total of 67% of science, mathematics, and social studies teachers reported needing assistance in obtaining information about instructional materials. (Chart III-7)
2. The availability of lab assistants or paraprofessionals and money to buy supplies on a day to day basis were seen as major need areas for mathematics, science, and social studies teachers. (Chart III-8)
3. Issues related to facilities, equipment, and supplies are significantly more troublesome in science classes than in mathematics or social studies classes. (Chart III-8)
4. The largest problem perceived by mathematics teachers is the lack of materials for individualizing instruction. (Chart III-9)
5. Science teachers perceived three serious problems: inadequate facilities, insufficient funds for purchasing equipment and supplies, and lack of materials for individualizing instruction. (Chart III-10)
6. Social studies teachers perceive themselves as having more problems than mathematics and science teachers, but the severity of the problems does not seem as great. Their most troublesome problems are inadequate student reading abilities and need for individualized materials. (Chart III-11)
7. Only 22% of elementary school teachers feel "very well qualified" to teach science and 16% feel "not well qualified" to teach it. Sixty percent feel "adequately qualified." (Chart III-12)
8. A sizable number of secondary school science, mathematics, and social studies teachers feel inadequately qualified to teach one or more of their courses. (Chart III-13)

Public

Ninety-seven percent of the public views mathematics as an essential for high school students. Eighty-three percent regard science as essential. (Chart III-14)

Chart III-1: Attitudes of students in Grades 1 to 6 toward school

Attitudes toward school exhibit a steady decline with increasing grade levels.



Source: The Condition of Education, NCES, 1982, p. 201.

Table III-1: Attitudes of students in grades 1 to 6 toward mathematics and school, by race: fall and spring 1976

Race and Grade Level	Mathematics		School in General	
	Fall	Spring	Fall	Spring
	Mean Positive Responses[1]			
White:				
Grade 1	—	27.99	—	24.41
Grade 2	26.74	27.28	23.97	23.81
Grade 3	26.28	26.96	23.79	23.47
Grade 4	24.20	25.47	23.20	22.56
Grade 5	24.10	24.48	22.72	21.88
Grade 6	23.56	23.42	22.31	21.12
Other races:				
Grade 1	—	31.72	—	26.65
Grade 2	29.72	31.07	25.35	25.58
Grade 3	29.97	31.09	25.43	24.95
Grade 4	28.18	28.61	24.76	23.98
Grade 5	28.10	29.22	24.27	23.37
Grade 6	28.10	28.13	23.63	22.74

—Not Available

[1] Attitudes are based on the mean positive responses to 66 items of student affective measures.

Source: U.S. Office of Education, Office of Evaluation and Dissemination, Study of Sustaining Effects of Compensatory Education on Basic Skills, special tabulations.

Chart III-2: Percentages of students naming various subjects in school as their most favorite, ages 9, 13, and 17

The popularity of science and social studies, never very high among students, increases somewhat as students age. Mathematics, by contrast, is the favorite of nearly half the 9-year-olds yet becomes less popular as students age. It is, even so, the favorite of more 13- and 17-year-olds than either science or social studies.

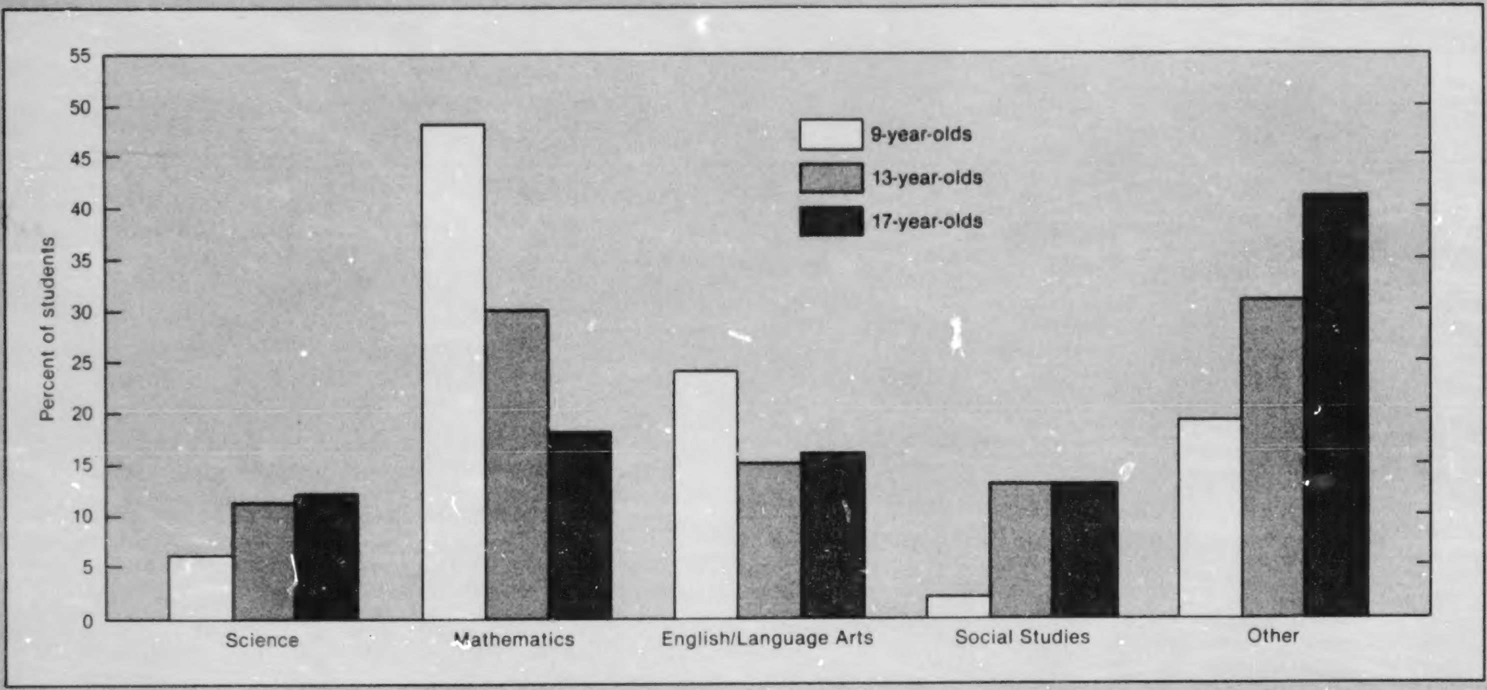


Table III-2: Percentages of students naming various subjects in school as their most favorite, ages 9, 13, and 17

	Percent Naming Favorite Subject		
	Age 9	Age 13	Age 17
Science	6	11	12
Mathematics	48	30	18
English/language arts	24	15	16
Social studies	3	13	13
Other	19	31	41

Source: National Assessment of Educational Progress, *Attitudes Toward Science*, p. 5.

Chart III-3: Percent of college-bound seniors intending to study science, engineering, mathematics or social sciences, by sex, 1979

About 32% of college-bound seniors said that they intended, as a first choice, to study science, engineering, mathematics, or social science. The greatest differences between the sexes were in psychology and engineering.

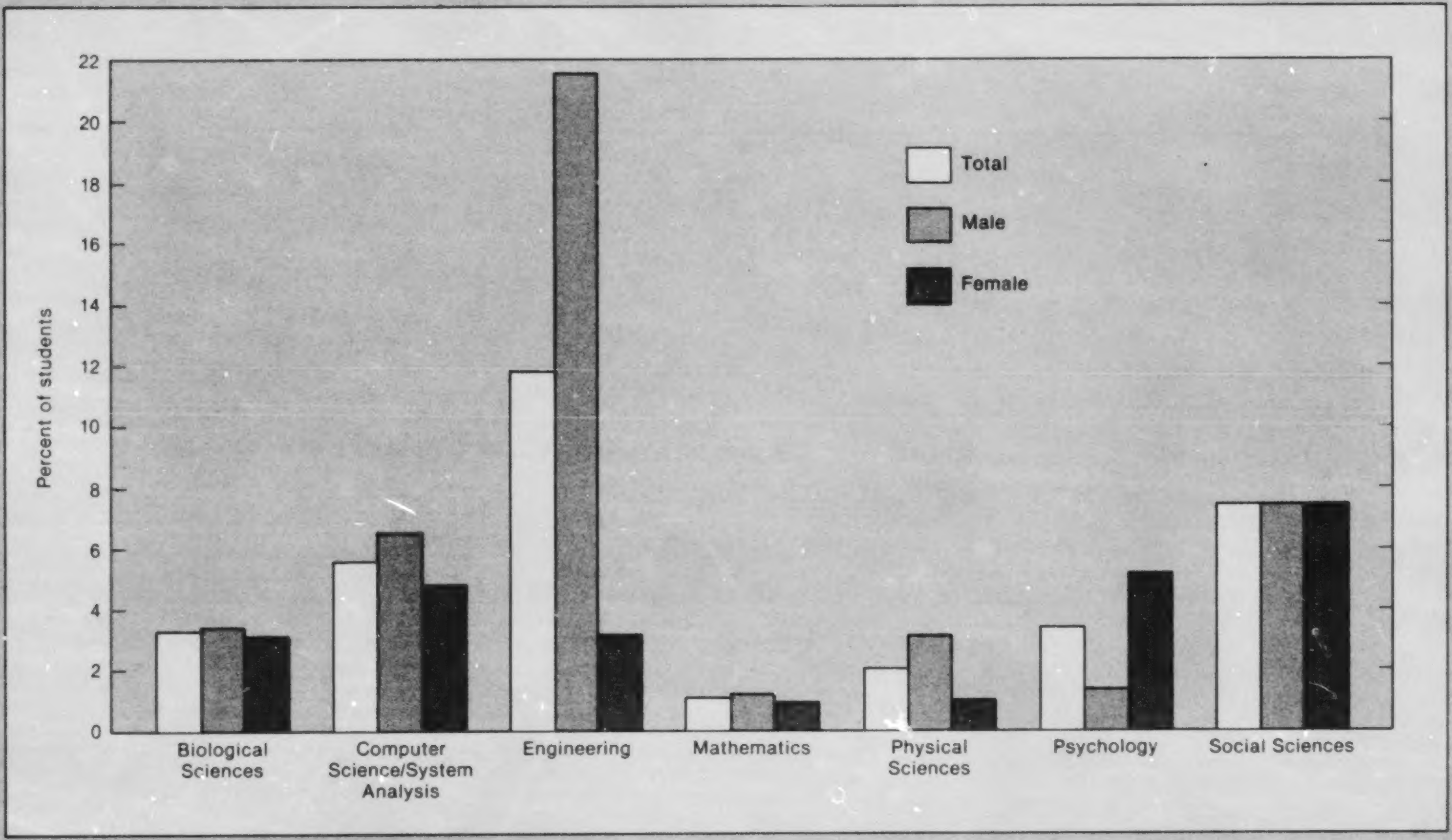


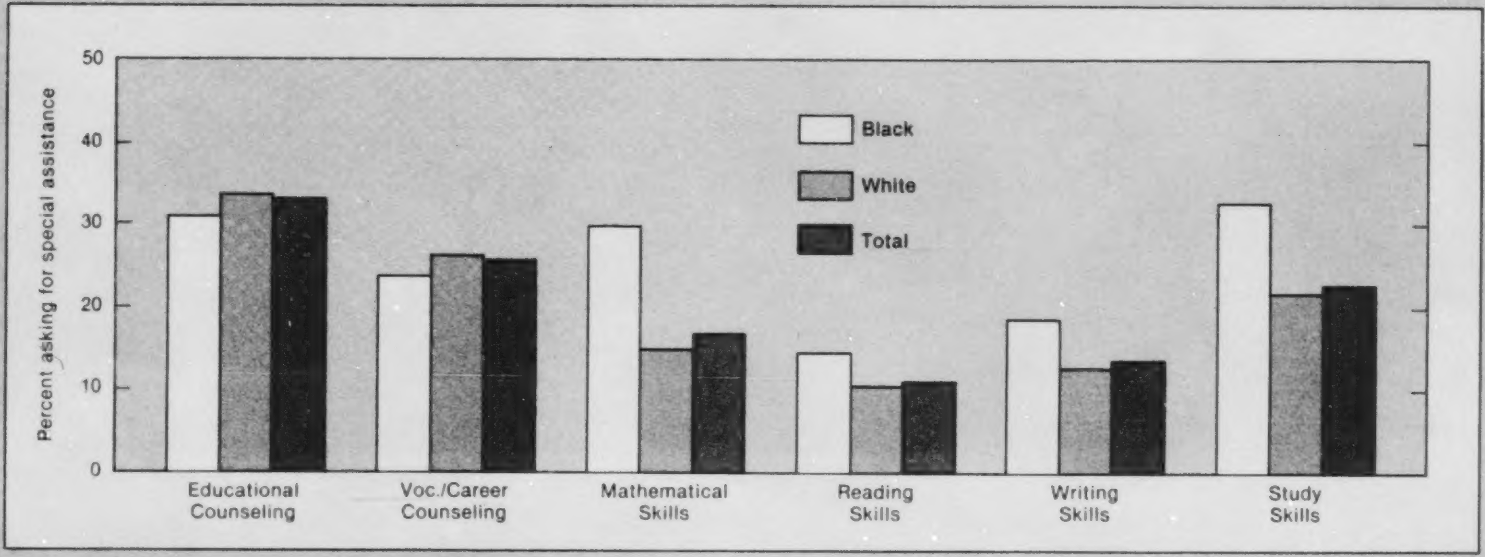
Table III-3: Percent of college-bound seniors intending to study various fields, by sex, 1980-81

Number Responding	Male 425,862	Female 480,333	Total 906,195
	Male %	Female %	Total %
Arts and Humanities	9.9	13.4	11.7
Architecture/Environmental Design	3.2	0.8	2.0
Art	2.3	5.4	3.9
English/Literature	0.9	1.9	1.4
Foreign Languages	0.3	1.4	0.9
Music	1.8	1.7	1.7
Philosophy and Religion	0.6	0.3	0.4
Theater Arts	0.8	1.9	1.4
Biological Sciences and Related Areas	15.0	24.0	20.2
Agriculture	2.0	1.0	1.5
Biological Sciences	3.4	3.2	3.3
Forestry/Conservation	1.4	0.4	0.9
Health and Medical	9.0	19.3	14.4
Business, Commerce, and Communications	21.1	23.3	22.3
Business and Commerce	17.6	19.4	18.5
Communications	3.5	4.0	3.7
Physical Sciences and Related Areas	32.3	10.0	20.5
Computer Science/Systems Analysis	6.5	4.8	5.6
Engineering	21.5	3.2	11.8
Mathematics	1.2	1.0	1.1
Physical Sciences	3.1	1.0	2.0
Social Sciences and Related Areas	13.7	22.7	18.5
Education	2.6	8.6	5.7
Ethnic Studies	0.0	0.0	0.0
Geography	0.1	0.0	0.0
History and Cultures	0.7	0.4	0.5
Home Economics	0.1	1.0	0.6
Library Science	0.0	0.1	0.0
Military Science	1.4	0.1	0.7
Psychology	1.4	5.2	3.4
Social Sciences	7.4	7.4	7.4
Miscellaneous	7.2	6.6	6.9
Other	1.2	0.9	1.1
Trade and Vocational	1.2	0.9	1.1
Undecided	4.8	4.8	4.8

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1981*, p. 16.

Chart III-4: Plans of college-bound seniors to ask colleges for special assistance, by areas of need and ethnic group, 1980-81

In the basic skills, a greater percentage of students felt that they would need help in mathematics than in reading and writing.



Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1981*, p. 17.

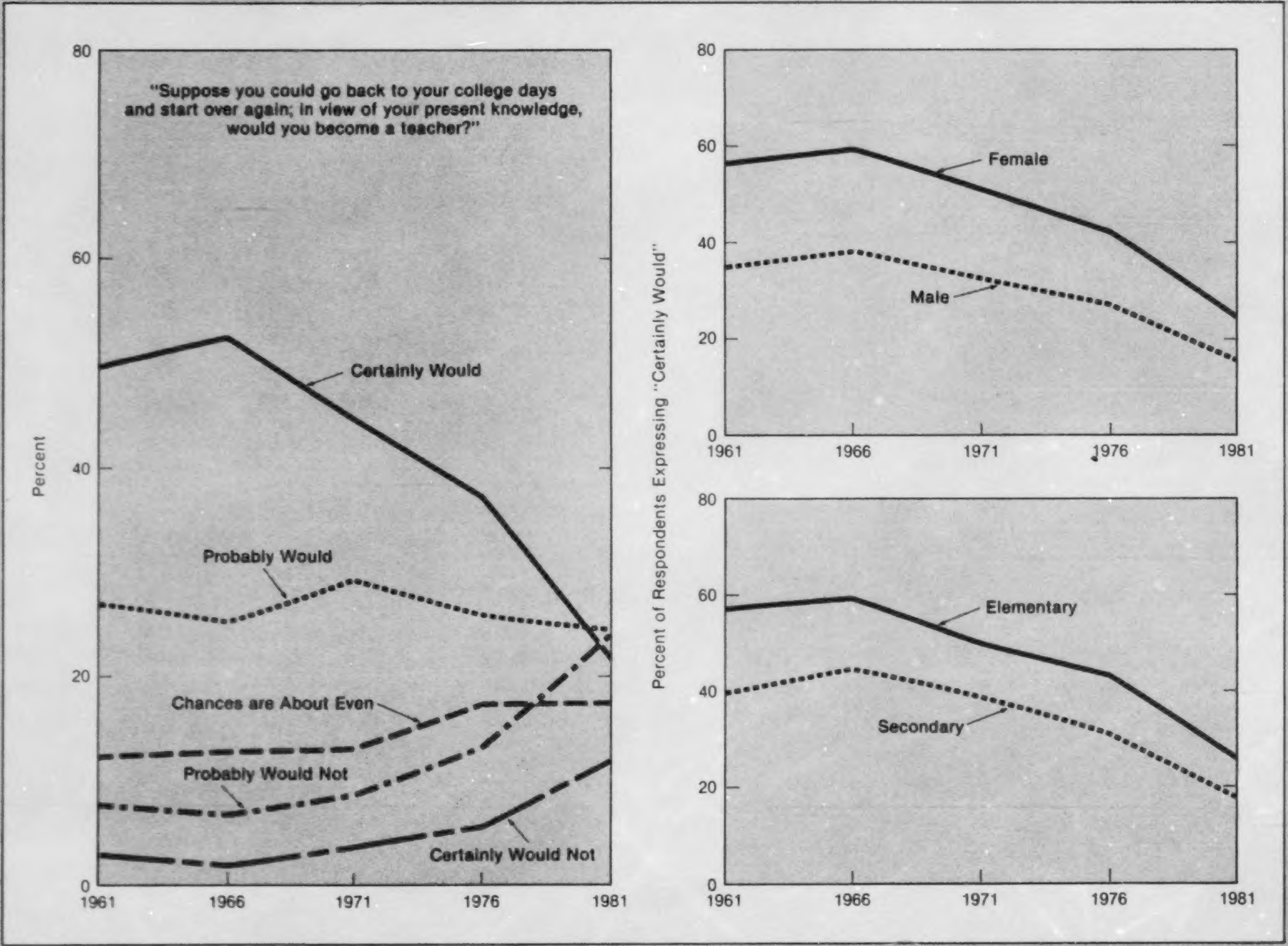
Table III-4: Plans of college bound seniors to ask college for special assistance, by areas of need and ethnnic group, 1980-81

	American Indian %	Black %	Mexican-American %	Oriental %	Puerto Rican %	White %	Other %	Total %
Educational Counseling	33.3	30.8	42.5	41.4	36.3	33.5	34.4	33.1
Voc/Career Counseling	24.6	23.5	30.6	32.9	23.1	26.2	25.3	25.7
Mathematical Skills	22.2	29.9	25.5	18.8	20.6	14.8	20.2	16.5
Reading Skills	13.4	14.2	16.3	20.9	14.8	10.2	13.9	11.0
Writing Skills	16.2	18.5	20.6	25.1	17.5	12.5	17.7	13.6
Study Skills	26.9	32.2	30.1	24.1	25.0	21.4	23.4	22.4
Part-Time Work	41.1	52.4	41.5	39.3	44.8	38.6	39.2	39.3
Personal Counseling	4.3	4.7	4.6	5.4	4.3	3.2	4.9	3.4
Seeking Assistance	87.2	94.4	92.1	89.3	90.3	79.5	86.6	80.4
Number Responding	5,048	82,162	15,765	31,329	10,393	747,712	20,274	947,879

Source: Admissions Testing Program at the college board, *National Report, College Bound Seniors, 1981*, p. 17.

Chart III-5: Attitudes toward the teaching profession: opinions of public school teachers

The proportion of teachers who would choose the teaching profession if they had a chance to start over declined considerably from 1961 to 1981. In every year, men were less likely than women to affirm their original choice, and secondary teachers were less likely than elementary teachers to do so.



Source: The Condition of Education, NCES, 1982, p. 107.

Table III-5: Opinions of public school teachers toward their profession: 1961, 1966, 1971, 1976, and 1981

"Suppose you could go back to your college days and start over again; in view of your present knowledge, would you become a teacher?

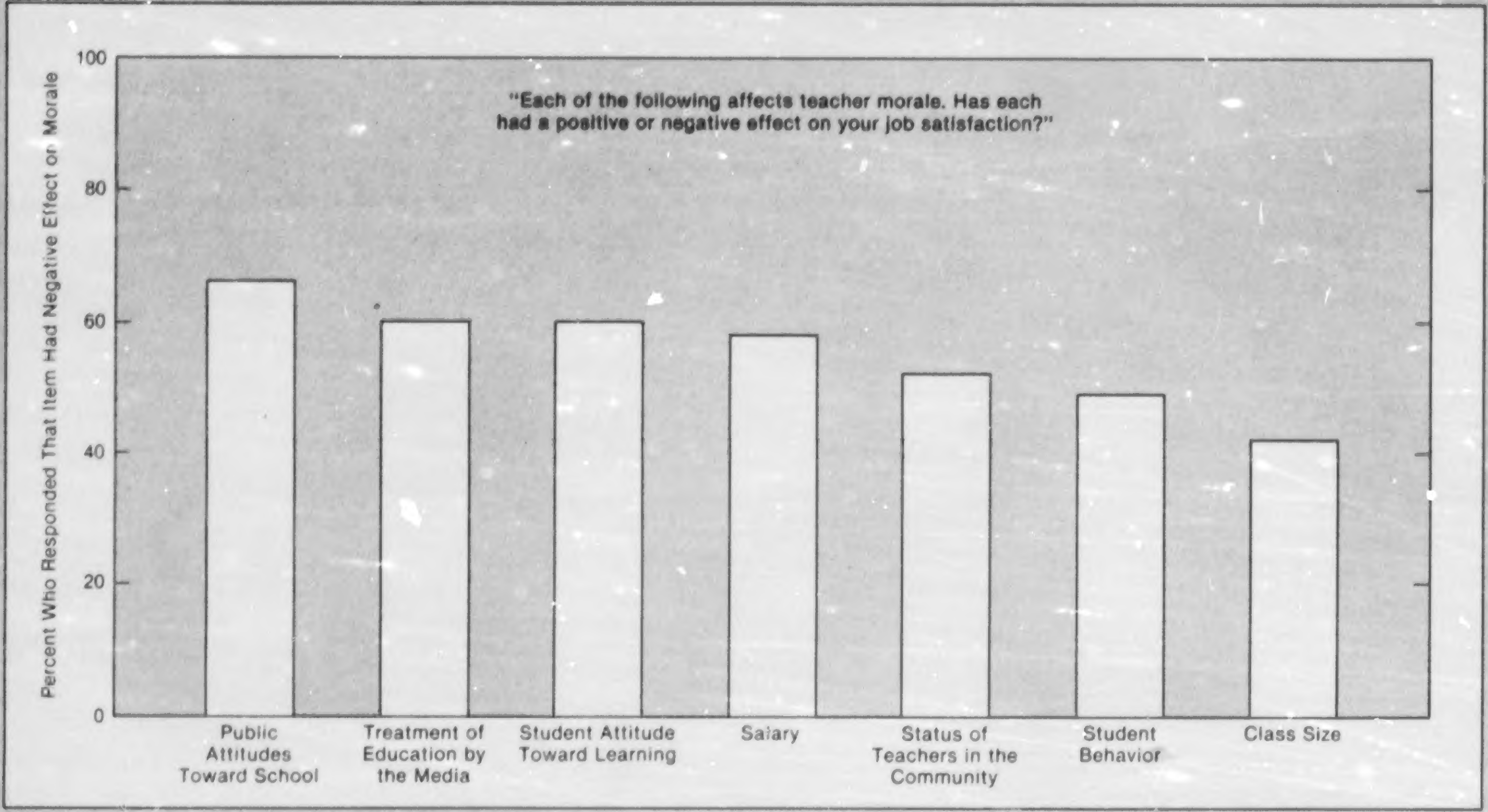
	Year				
	1961	1966	1971	1976	1981
Responses	Percent Distribution of Responses				
Total	100.0	100.0	100.0	100.0	100.0
Certainly Would	49.9	52.6	44.9	37.5	21.8
Male	35.2	38.0	33.0	27.3	16.0
Female	56.6	59.2	51.1	42.5	24.8
Elementary	57.3	59.6	50.1	43.5	26.4
Secondary	40.0	44.9	39.1	31.7	18.1
Under Age 30	—	49.2	41.4	35.6	28.5
Age 30 to 39	—	50.9	40.1	34.5	16.2
Age 40 to 49	—	48.9	47.1	41.6	21.3
Age 50 and Over	—	60.2	53.0	41.3	27.3
Probably Would	26.9	25.4	29.5	26.1	24.6
Chances Are About Even	12.5	12.9	13.0	17.5	17.6
Probably Would Not	7.9	7.1	8.9	13.4	24.0
Certainly Would Not	2.8	2.0	3.7	5.6	12.0

—Not available.

Source: National Education Association, *Status of the American Public School Teacher*, various years.

Chart III-6: Job satisfaction: opinions of public school teachers

More than half of all teachers believed that salary, community and media attitudes, teachers' status, and student attitudes towards learning had a negative effect on their job satisfaction. Salary had a more negative effect in the South than in other regions. In nearly every category, secondary school teachers were more likely than teachers of other levels to respond that any item had a negative effect.



Source: The Condition of Education, NCES, 1982, p. 105.

Table III-6: Opinions of public school teachers toward job satisfaction, by region, enrollment, size of school district, and teaching level: 1980

"Each of the following affects teacher morale. Has each had a positive or negative effect on your job satisfaction?"

Item	Total	Region[1]				Enrollment Size of School District			Teaching Level		
		Northeast	Southeast	Middle	West	Under 3,000	3,000-24,999	25,000 and Over	Elementary	Junior high	Senior high
	Percent Who Responded That an Item Had a Negative Effect on Morale										
Salary	58	49	70	52	61	57	59	58	51	63	65
Class Size(s)	42	42	43	37	48	30	44	51	43	43	38
Physical Facilities/ Environment	36	39	37	33	37	33	37	39	33	39	41
Job Security	23	27	16	26	22	19	24	24	21	24	27
Public Attitudes Toward School	66	74	60	63	67	62	66	70	62	68	71
Status of Teachers in the Community	52	61	43	52	52	49	52	54	49	52	55
Treatment of Education by the Media	60	66	56	56	63	51	60	68	58	60	63
Relationship with Parents	25	29	32	21	21	22	25	30	23	27	28
Student Behavior	49	51	52	44	49	44	47	57	44	53	50
Student Attitude Toward Learning	60	62	61	57	61	59	58	65	48	70	73
Relationships with Other Teachers	9	10	8	9	8	9	9	9	8	9	10
Intangible Rewards from Teaching	20	23	24	18	17	17	18	26	17	22	22
Opportunity for Professional Growth	37	42	33	37	36	38	36	39	32	41	43

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[1] Regions defined by the National Education Association.

Source: National Education Association, *National Teacher Opinion Poll*, 1980.

Chart III-7: K-12 science, mathematics, and social studies teachers' needs for assistance

A total of 67% of teachers reported needing assistance in obtaining information about new instructional materials. Of that number, less than half received adequate assistance.

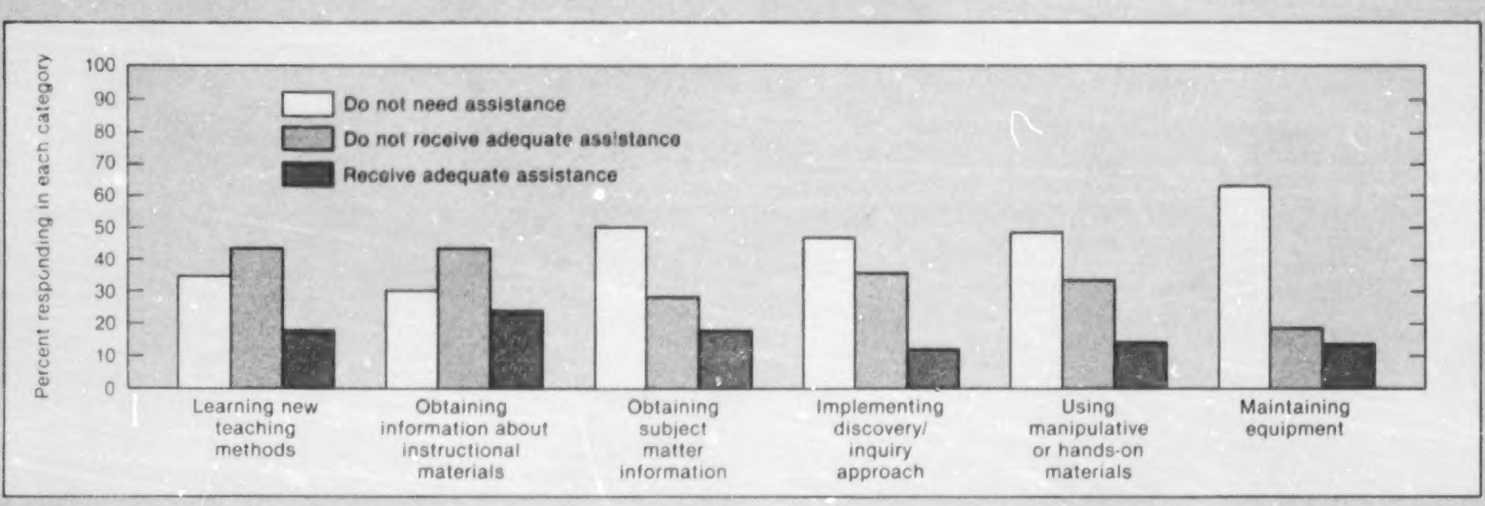

Table III-7: K-12 science, mathematics, and social studies teachers' needs for assistance

	Percent of Teachers			
	Do Not Need Assistance	Do Not Receive Adequate Assistance	Receive Adequate Assistance	Missing
Establishing instructional objectives	70	15	11	4
Lesson planning	83	9	5	4
Learning new teaching methods	34	43	18	4
Actually teaching lessons	78	14	5	4
Obtaining information about instructional materials	30	43	24	4
Obtaining subject matter information	50	28	18	5
Implementing discovery/inquiry approach	47	36	12	5
Using manipulative or hands-on materials	48	33	14	5
Maintaining equipment	62	19	14	4
Working with small groups of students	60	29	6	4
Maintaining discipline	82	8	6	3
Articulating instruction across grade levels	57	29	8	6
Sample N = 4829				

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 147.

Chart III-8: K-12 science, mathematics and social studies teachers' perceptions of classroom needs

Issues related to facilities, equipment and space for classroom preparation are more troublesome in science classes than in mathematics or social studies classes. However, the availability of lab assistants or paraprofessionals and money to buy supplies on a day-to-day basis were seen as problems for teachers of all three subjects.

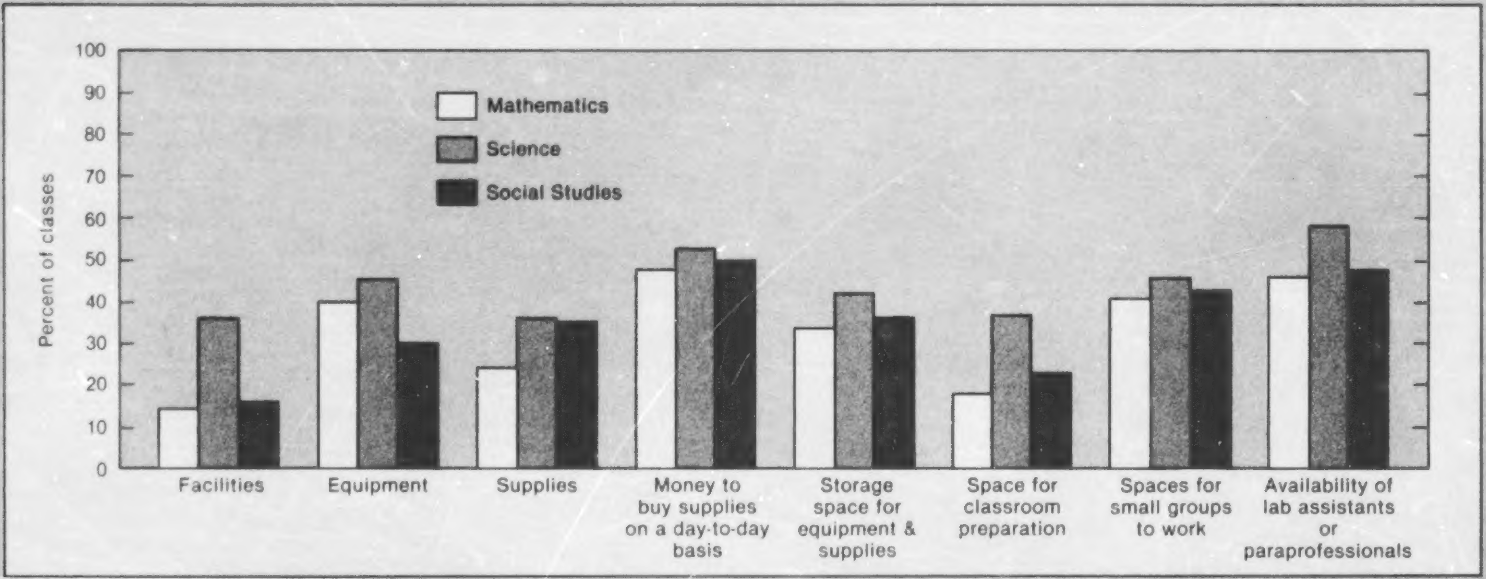

Table III-8: K-12 science, mathematics, and social studies teachers' perceptions of classroom needs (by percent of classes)

Area	Mathematics					Science					Social Studies				
	K-3	4-6	7-9	10-12	Total	K-3	4-6	7-9	10-12	Total	K-3	4-6	7-9	10-12	Total
Facilities	7	13	20	8	14	27	42	44	34	36	12	13	24	17	16
Equipment	36	52	40	30	40	46	55	38	35	45	26	28	33	32	30
Supplies	22	36	22	13	24	38	53	27	21	36	27	38	38	39	35
Money to Buy Supplies on a Day-to-Day Basis	48	57	43	39	48	49	57	57	47	53	46	53	53	52	50
Storage Space for Equipment and Supplies	36	35	30	29	33	40	50	42	39	42	31	39	38	38	36
Space Available for Classroom Preparation	24	13	17	13	18	30	50	39	28	37	17	20	28	27	23
Spaces for Small Groups to Work	33	43	49	41	41	35	54	56	44	46	28	42	53	51	43
Availability of Laboratory Assistants or Paraprofessional Help	37	54	51	46	46	48	56	72	62	58	42	50	54	48	48
Sample N	297	277	550	549	1672	287	271	535	586	1679	254	281	453	490	1478

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 135.

Chart III-9: K-12 mathematics teachers' perceptions of problem areas

For the most part, mathematics teachers do not seem beleaguered by problems. In only two categories, insufficient funds for purchasing equipment and supplies, and lack of materials for individualizing instruction, did the combined problem options account for more than 50% of the responses and no category received as much as a 20% response indicating a serious problem.

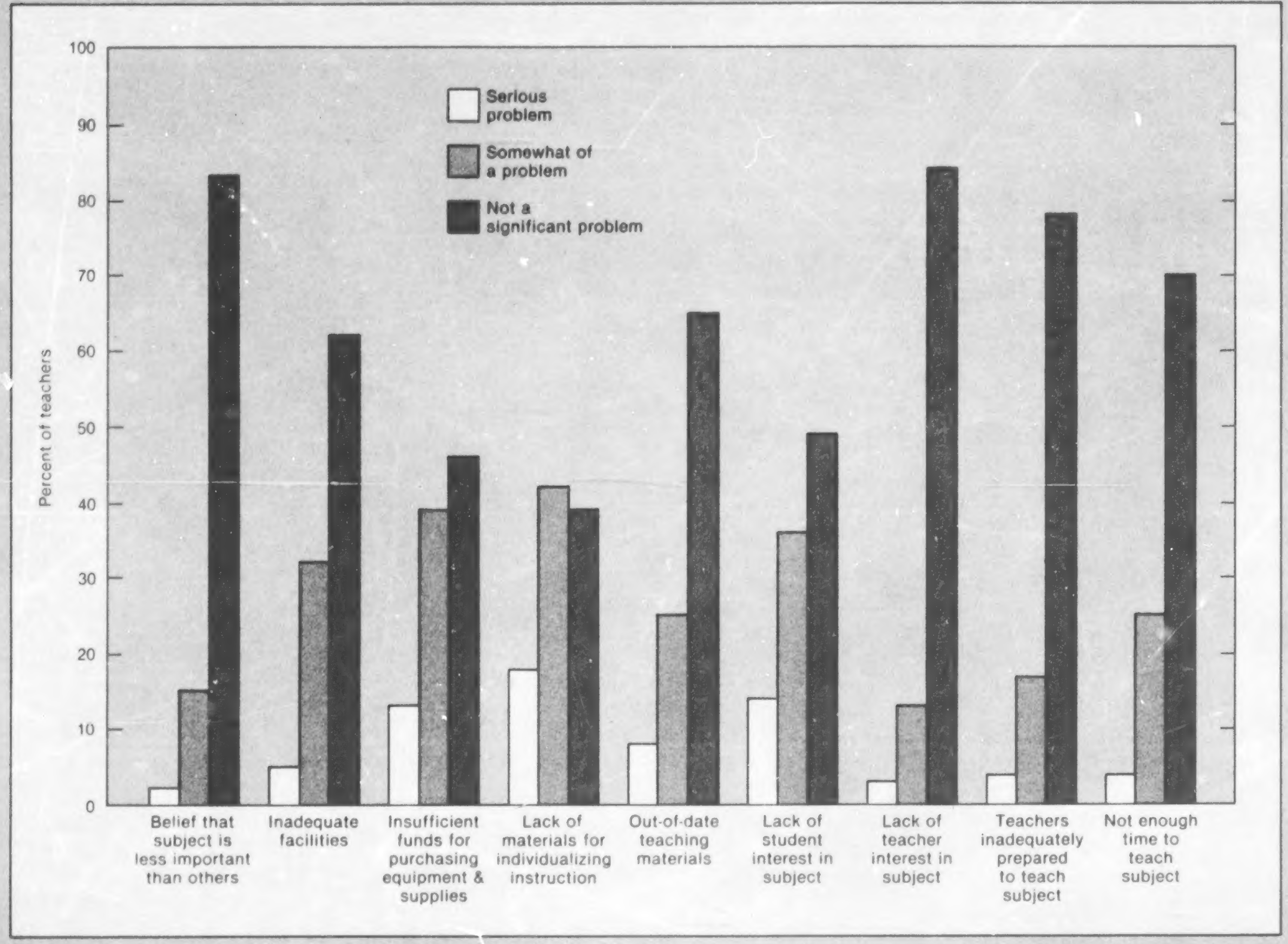

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Chart III-10: K-12 science teachers' perceptions of problem areas

Compared to the mathematics teachers, science teachers perceive science instruction as having more problems. In three categories — inadequate facilities, insufficient funds for purchasing equipment and supplies, and lack of materials for individualizing instruction — the two problem options accounted for more than 50% of the responses and the same three categories received more than 25% response as indicating a serious problem.

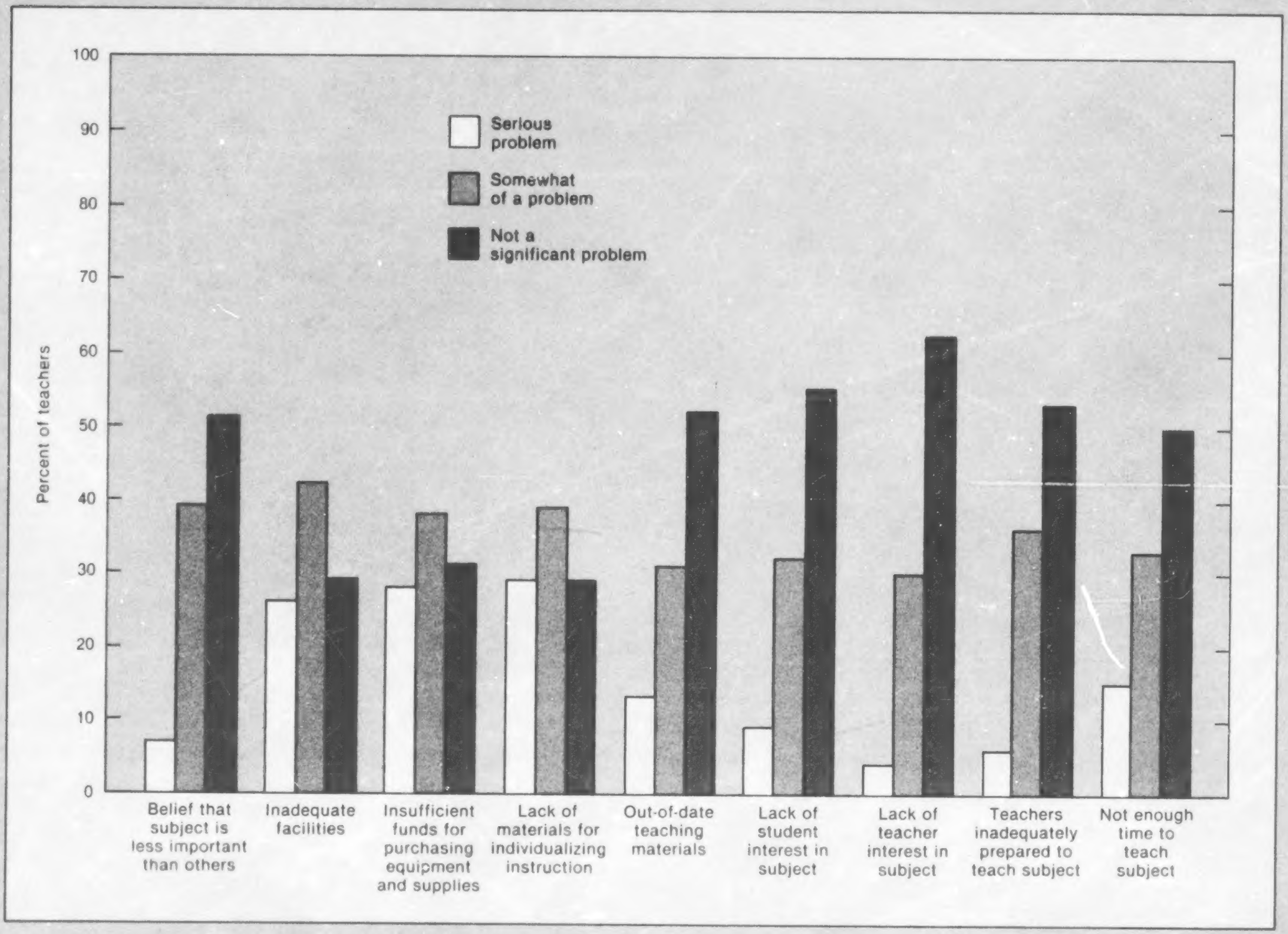


Chart III-11: K-12 social studies teachers' perceptions of problem areas

Compared to the mathematics and science teachers, social studies teachers perceive social studies instruction as having more problems. In six categories, the two problem options accounted for 50% or more of the responses: insufficient funds for purchasing supplies and equipment, lack of materials for individualizing instruction, out-of-date teaching materials, lack of student interest in subject, inadequate student reading abilities, and belief that the subject is less important than other subjects.

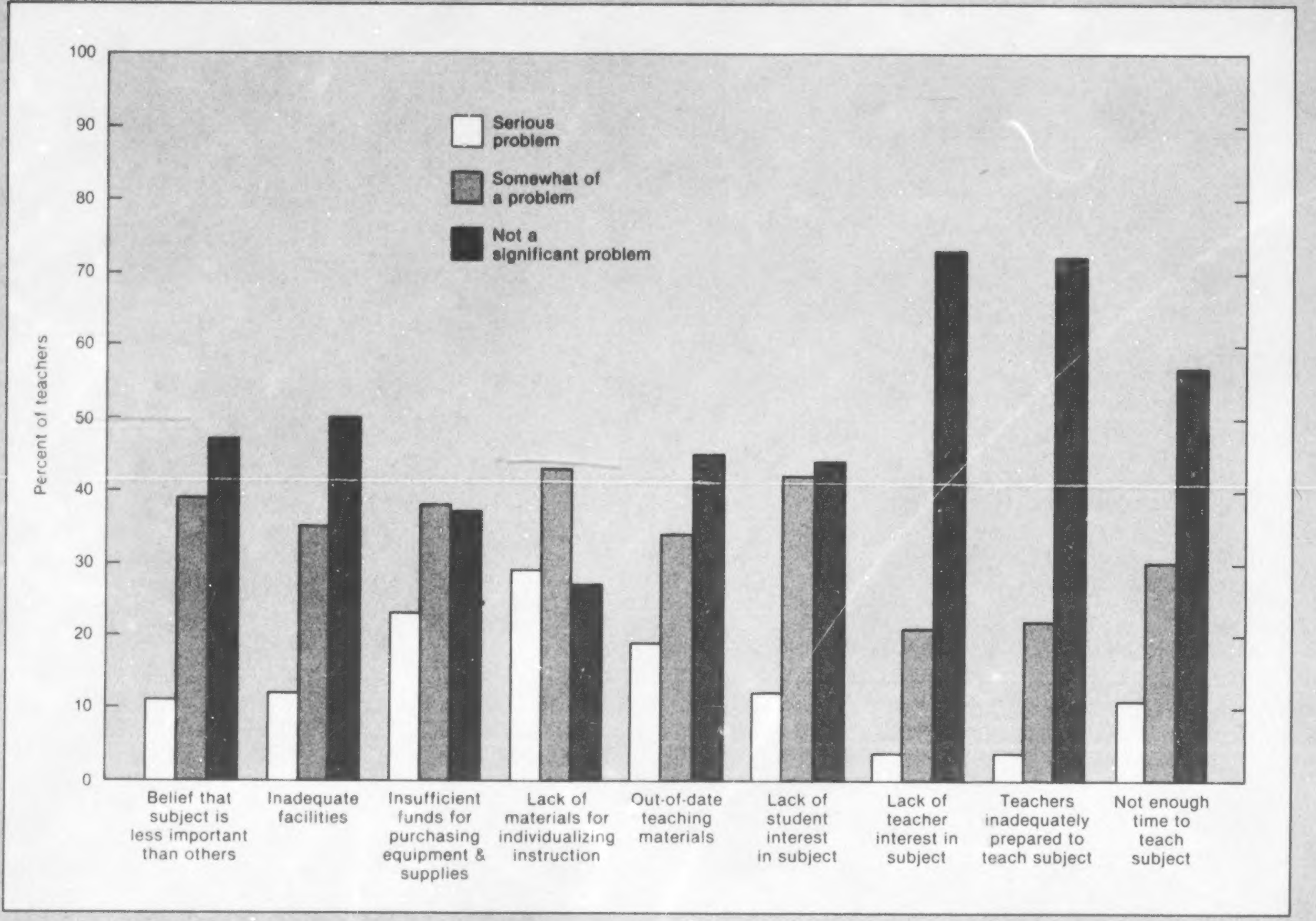


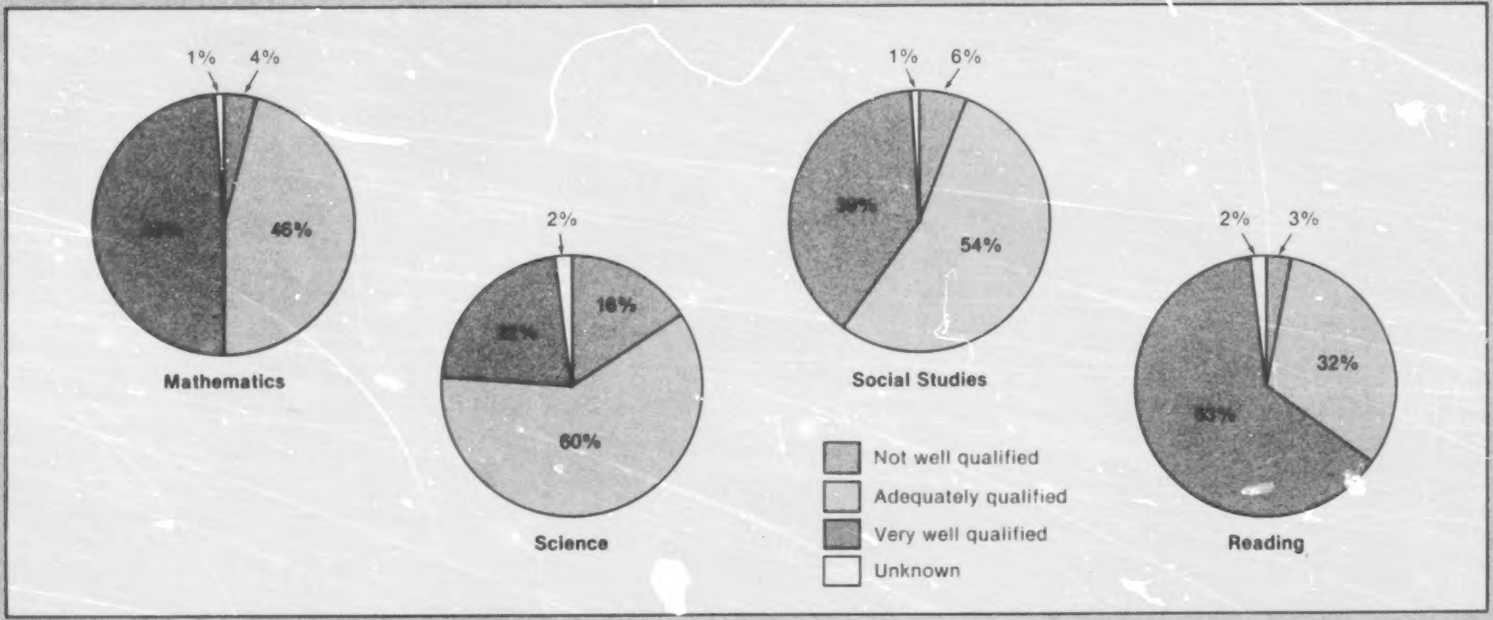
Table III-9, 10, 11: K-12 mathematics, science and social studies teachers' perceptions of problem areas

Factor	Mathematics				Science				Social Studies			
	Serious Problem	Somewhat of a Problem	Not a Significant Problem	Missing	Serious Problem	Somewhat of a Problem	Not a Significant Problem	Missing	Serious Problem	Somewhat of a Problem	Not a Significant Problem	Missing
Belief that this subject is less important than other subjects	2	15	83	1	7	39	51	3	11	39	47	2
Compliance with Federal regulations	1	8	88	2	3	14	74	9	3	13	81	4
Inadequate facilities	5	32	62	2	26	42	29	2	12	35	50	3
Insufficient funds for purchasing equipment and supplies	13	39	46	2	28	38	31	4	23	38	37	2
Lack of materials for individualizing instruction	18	42	39	1	29	39	29	3	29	43	27	2
Out-of-date teaching materials	8	25	65	2	13	31	52	4	19	34	45	2
Insufficient numbers of textbooks	4	13	82	1	9	15	71	5	12	20	66	2
Lack of student interest in subject	14	36	49	2	9	32	55	4	12	42	44	2
Inadequate student reading abilities	24	47	28	1	24	43	29	4	32	44	21	2
Lack of teacher interest in subject	[illegible]	13	84	1	4	30	62	5	4	21	73	2
Teachers inadequately prepared to teach subject	4	17	78	1	6	36	53	5	4	22	72	2
Lack of teacher planning time	11	32	55	2	18	38	40	4	16	31	52	2
Not enough time to teach subject	4	25	70	1	15	33	50	3	11	30	57	2
Class sizes too large	19	38	42	1	15	34	49	3	18	31	49	2
Difficulty in maintaining discipline	8	28	63	1	5	24	68	3	5	23	70	2
Inadequate articulation of instruction across grade levels	9	34	55	2	9	40	45	6	11	37	50	3
Inadequate diversity of electives	5	20	69	6	8	29	54	9	10	28	57	6
Low enrollments in courses	3	10	82	6	3	11	77	9	2	10	82	7
Sample N	1672				1679				1478			

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 158.

Chart III-12: Elementary teachers' perception of their qualifications by subject

Nearly two-thirds of all elementary teachers feel "very well qualified" to teach reading, while only 22% feel "very well qualified" to teach science. At the other end of the scale, 16% of the teachers feel "not well qualified" to teach science, compared to 6% or fewer in each of the other three areas.



Source: Weiss, Iris R., *et al*, *The Status of Pre-College Science, Mathematics, and Social Studies Educational Practices in U.S. Schools: An Overview and Summaries of Three Studies*, p. 13.

Table III-12: Elementary teachers' perceptions of their qualifications to teach each subject

	Percent of Teachers			
Subject	Not Well Qualified	Adequately Qualified	Very Well Qualified	Missing
Mathematics	4	46	49	1
Science	16	60	22	2
Social Studies	6	54	39	1
Reading	3	32	63	2
Sample N = 1667				

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 142.

Chart III-13: Secondary school teachers' perceptions that they are inadequately qualified to teach one or more of their classes

While most secondary school science, mathematics, and social studies teachers feel at least adequately qualified to teach all of their courses, a sizable number of them feel inadequately qualified to teach one or more of their courses.

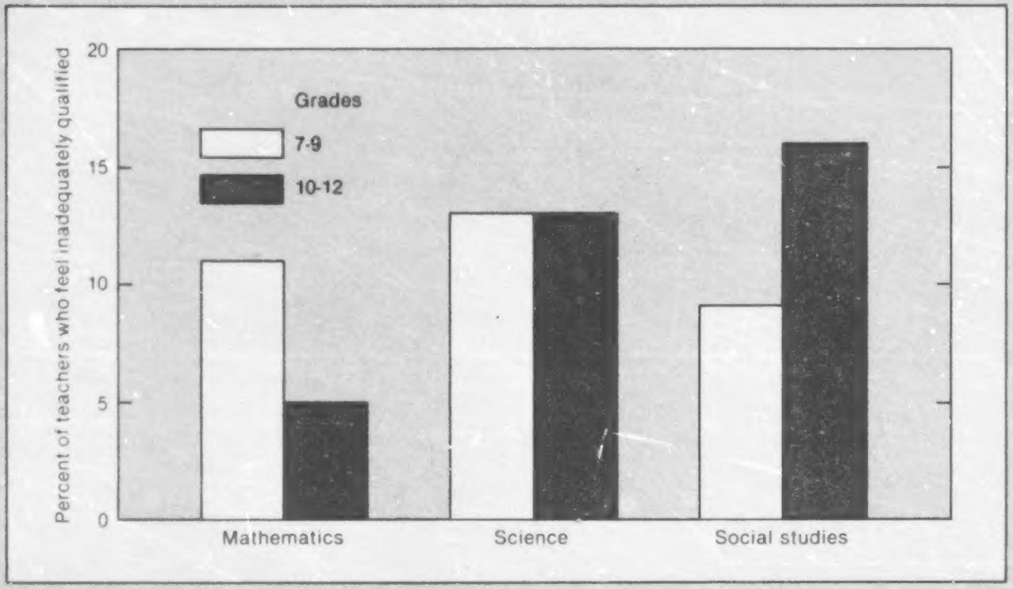


Table III-13: Percent of secondary teachers of each subject who feel inadequately qualified to teach one or more of their courses

	Yes	No	Unknown
Mathematics			
7-9 (N = 550)	11	88	1
10-12 (N = 548)	5	95	0
Science			
7-9 (N = 535)	13	86	1
10-12 (N = 586)	13	82	3
Social Studies			
7-9 (N = 453)	9	89	2
10-12 (N = 490)	16	81	3

Source: Weiss, Iris R., *Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education*, p. 14.

Chart III-14: Public view of subjects essential to all high school students

Mathematics is viewed as essential by more people than any other subject. Science ranked fifth out of eleven subjects.

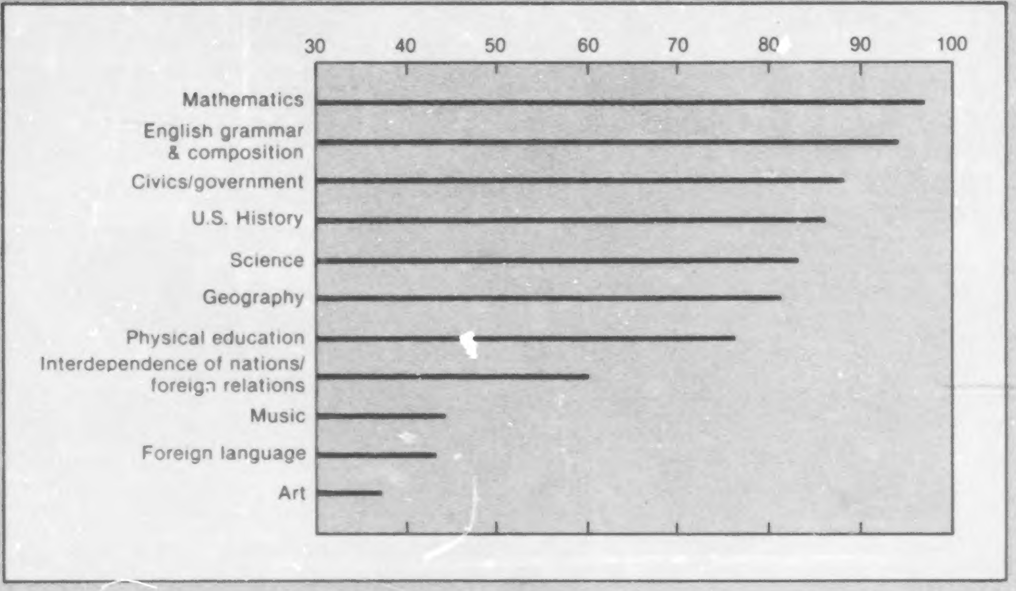


Table III-14: Public view of subjects essential to all high school students

	National Totals		
	Essential %	Not Too Essential %	Don't Know/ No Answer %
Mathematics	97	1	2
English grammar & composition	94	3	3
Civics/government	88	8	4
U.S. history	86	11	3
Science	83	14	3
Geography	81	16	3
Physical education	76	21	3
Interdependence of nations—foreign relations	60	32	8
Music	44	52	4
Foreign language	43	53	4
Art	37	58	5

Source: Gallup, George H. © 1979. Phi Delta Kappa, Inc., "The Eleventh Annual Gallup Poll of the Public's Attitudes Toward the Public Schools," *Phi Delta Kappan*, September, 1979.

Chapter IV
TEST DATA

INTRODUCTION

No measure of the health of American education receives as much scrutiny as student test data. Recent attention has focused on measures of what people know and what intellectual and performance skills they possess. Such measures are usually standardized tests (e.g., Scholastic Aptitude Tests, Graduate Record Examinations, National Assessment of Educational Progress instruments).

The test data contained in this chapter are grouped for K-12 students and higher education students.

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HIGHLIGHTS

K-12

1. Background and instructional grouping factors have been found to influence achievement test scores. (Chart IV-1)
2. Time spent in mathematics instruction has a positive effect on mathematics achievement in grade school. (Chart IV-2)
3. 9-year-old black students showed a significant gain between 1973 and 1978 NAEP mathematics assessments. (Chart IV-3)
4. Nevertheless, overall mathematical knowledge of black students, according to the NAEP results, was lower than white students in 1978. (Chart IV-4)
5. According to National Assessment of Educational Progress (NAEP) data, all age groups experienced statistically significant declines in science achievement during the first test interval (1969-70 to 1972-73). There were no significant changes during the second test interval (1972-73 to 1976-77). (Chart IV-5)
6. When analyzed separately as to type of science, NAEP data showed that all age groups experienced statistically significant declines in physical science achievement during the first test interval. Only the decline of the 9-year-olds was significant during the second interval. (Chart IV-6)
7. In biological science achievement, NAEP data shows that the only statistically significant change is the decline demonstrated by 17-year-olds during the first test interval. (Chart IV-7)
8. According to NAEP data, overall mathematics achievement declined for all ages tested in the test interval 1973 to 1978. The decline was statistically significant for the 13- and 17-year-olds. (Chart IV-8)
9. High school students who complete advanced mathematics courses perform better on mathematics achievement tests. (Chart IV-9)
10. Additional years of mathematics course taking is associated with higher mathematics achievement scores. (Chart IV-10)
11. Scholastic Aptitude Test (SAT) scores declined from 1969-1980; however, 1981 scores remained at the 1980 low point. (Chart IV-11)
12. Regarding SAT scores, the mathematics scores for men have consistently been well above those for women, and since 1972 verbal scores for men have also exceeded those of women. (Chart IV-12)
13. College-bound students who intended to major in biological sciences, engineering, math and physical sciences had SAT scores that were above the average for all college bound seniors. (Chart IV-12)
14. The college-bound seniors scoring, on the average, highest on their SAT's, tend to plan on studying science, engineering, mathematics, or English literature. (Chart IV-13)
15. In contrast to the SAT scores, the Admissions Testing Program Achievement Tests scores, averaged across all subjects, have held steady over the past six years, within a range of 526 in 1972 to 538 in 1976. (Chart IV-14)

Higher Education

As reflected by Graduate Record Examination (GRE) scores there were no statistically significant changes in either the verbal or quantitative aptitudes of prospective science graduate students. (Charts IV-15, 16)

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Chart IV-1: Factors contributing to achievement on spring mathematics scores

Factors Ranked by Order of Importance

Among background factors, fall mathematics scores, parental education, and race contributed to mathematics scores.

- Background Factors:
  - Fall Mathematics Scores*
    - Parental Education*
      - Race*
        - Compensatory Education
          - Family Income

Among instructional factors, large group instruction and tutoring contributed to mathematics scores, although time with a tutor was negatively associated.

- Instructional Grouping Factors:
  - Classroom Teacher, Over 20 Students*
    - Tutor*
      - Classroom Teacher, 14 to 20 Students
        - Independent Work-Program Materials
          - Classroom/Special Teacher, 1 to 6 Students
            - Classroom Teacher, 7 to 13 Students

*Statistically significant effect on spring mathematics scores based on the results of a multiple regression analysis ($R^2 = .8651$).

Source: The Condition of Education, NCES, 1982, p. 181.

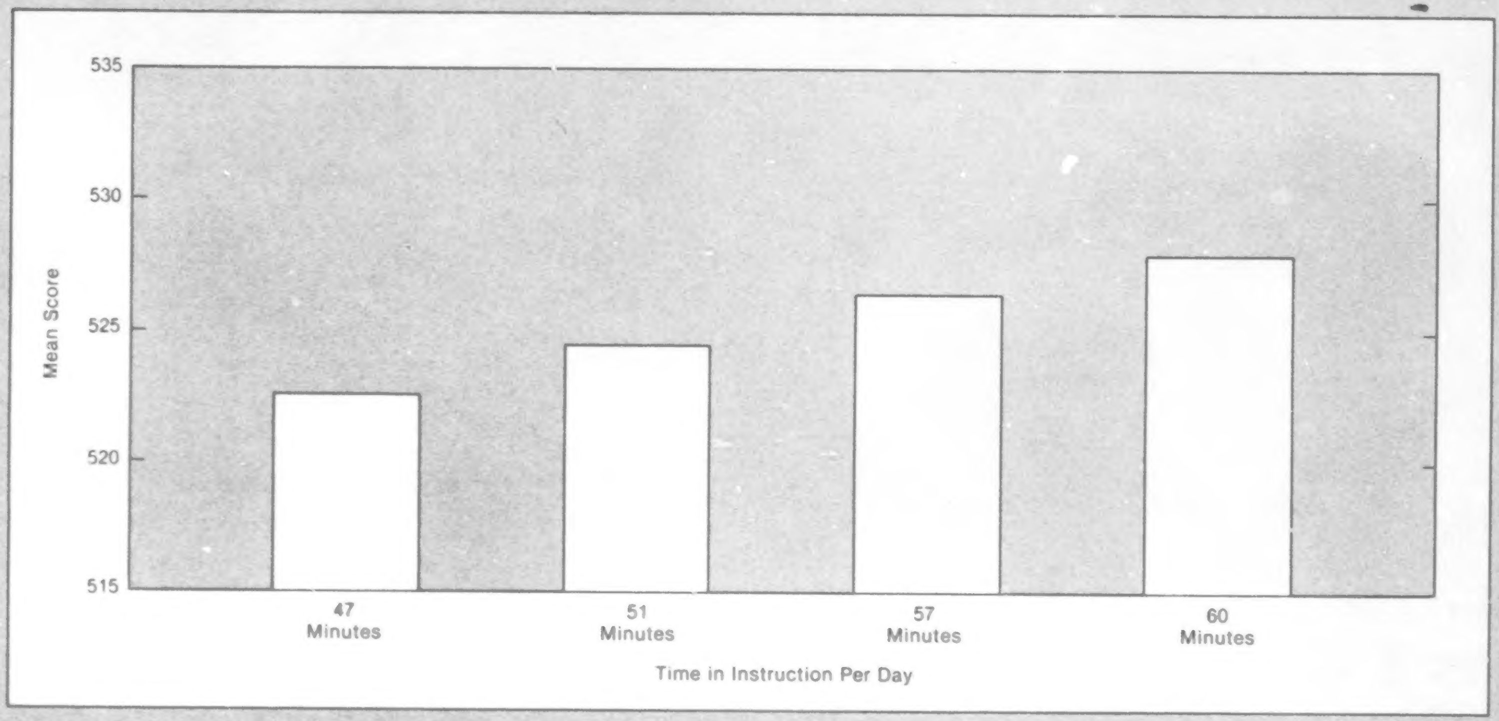
Table IV-1: Mean mathematics achievement scores of students in Grades 1 to 6 for significant instructional groupings, by time spent in instruction: spring 1976

Time Spent in Instructional Grouping	Mean Math Scores
*Classroom teacher, over 20 students	
No Time	524.24
Less than 10 Percent	519.87
10 to 19 Percent	523.90
20 to 29 Percent	523.44
30 Percent and Over	527.49
*Tutor	
No Time	525.50
Less Than 4 Percent	519.58
4 Percent and Over	521.81

Source: U.S. Office of Education, Office of Evaluation and Dissemination, Study of Sustaining Effects of Compensatory Education on Basic Skills special tabulations.

Chart IV-2: Effects of time spent in mathematics instruction on achievement scores

Time spent in mathematics classes had a slight effect on mathematics achievement of grade school students.



Source: The Condition of Education, NCES, 1982, p. 117.

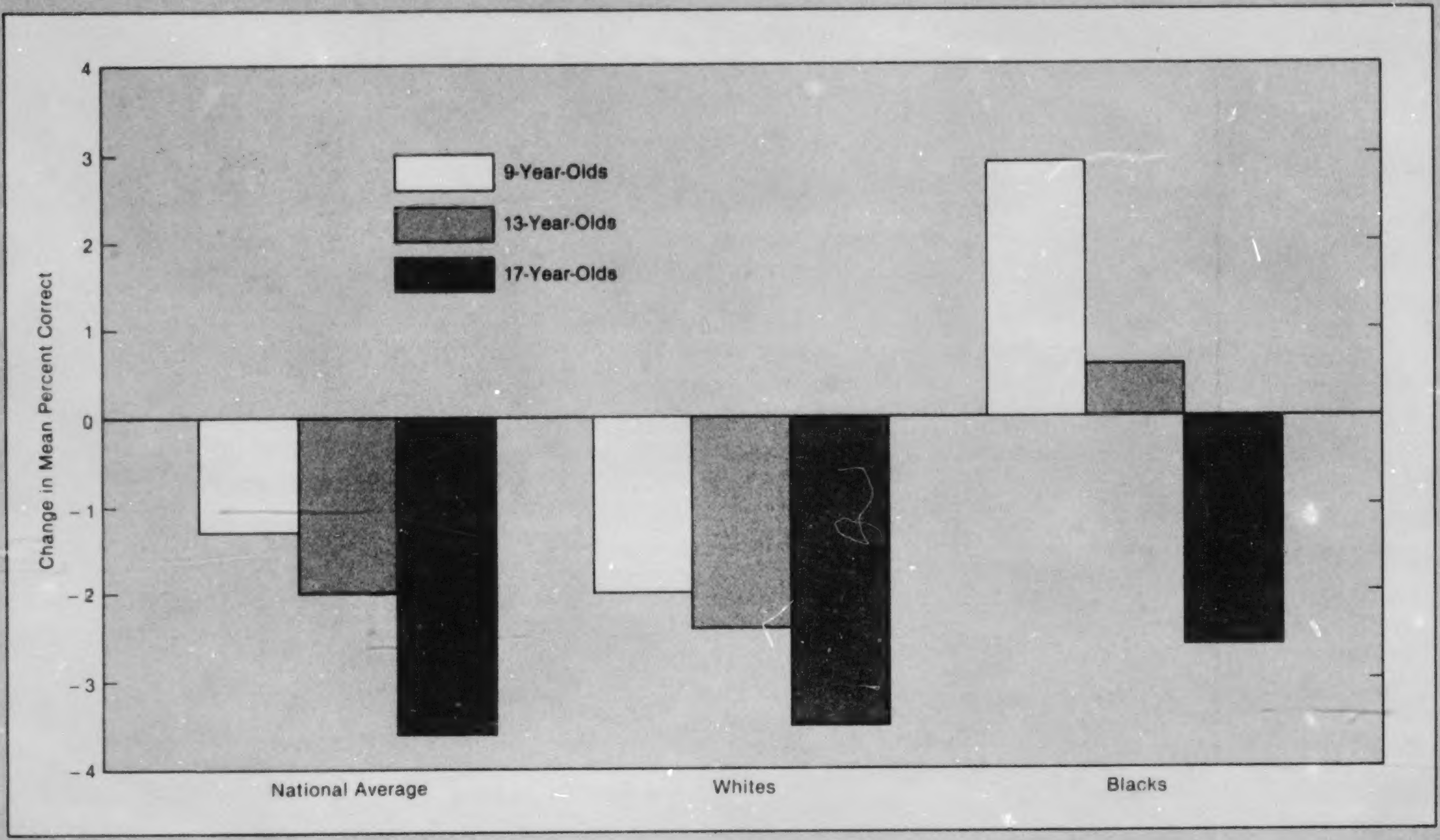
Table IV-2: Mathematics achievement scores of students in grades 1 to 6, by educational attainment of adult in household and time in instruction per day: spring 1976

Item	Mean Mathematics Scores
Education of Adult Household Member	
Male of Household:	
8th Grade or Less	522.89
1 to 3 Years of High School	523.34
High School Graduate	525.79
Some College	526.77
College Degree	529.35
Post-Graduate	533.07
Female of Household:	
8th Grade or Less	523.82
1 to 3 Years of High School	522.37
High School Graduate	525.61
Some College	530.68
College Degree	530.58
Post-Graduate	528.05
Time in Instruction Per Day	
Mathematics:	
47 Minutes	522.49
51 Minutes	524.43
57 Minutes	526.39
60 Minutes	527.95

Source: U.S. Office of Education, Office of Evaluation and Dissemination, Study of Sustaining Effects of Compensatory Education on Basic Skills, special tabulations.

Chart IV-3: Change in mathematics performance of 9-, 13-, and 17-year-olds: 1973 to 1978

While mathematical achievement test scores for 19-, 13-, and 17-year-olds fell nationally between 1973 and 1978, blacks' scores showed significant gains among the 9-year-olds.



Source: The Condition of Education, NCES, 1982, p. 189.

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Table IV-3: Mean mathematics performance of 9-, 13-, and 17-year-olds, by race, type of community, and parental education: 1973 and 1978

Characteristic	9-Year-Olds			13-Year-Olds			17-Year-Olds		
	1973	1978	Change	1973	1978	Change	1973	1978	Change
National Average	38.1	36.8	– 1.3	52.6	50.6	– 2.0	51.7	48.1	– 3.6
Race:									
White	41.1	39.1	– 2.0	56.6	54.2	– 2.4	54.5	51.0	– 3.5
Black	23.4	26.3	2.9	31.8	32.4	0.6	33.5	30.9	– 2.6
Type of Community[1]:									
Disadvantaged Urban	25.3	27.7	2.4	34.7	36.7	2.0	40.7	35.1	– 5.7
Advantaged Urban	46.6	46.0	– 0.7	63.6	59.4	– 4.2	59.5	57.3	– 2.2
Extreme Rural	34.0	32.1	– 1.9	50.0	45.2	– 4.8	48.4	46.4	– 2.0
Parental Education [2]:									
Not Graduated from High School	31.1	28.7	– 2.3	42.8	40.3	– 2.5	42.5	37.7	– 4.7
Graduated from High School	39.3	36.9	– 2.4	52.1	49.6	– 2.6	50.0	45.5	– 4.6
Post High School	44.3	42.6	– 1.7	60.8	58.2	– 2.5	57.9	54.1	– 3.8

[1] Communities are defined as one of three types: disadvantaged urban — cities with a population greater than 200,000 where a high proportion of the residents are on welfare or are not regularly employed; advantaged urban — cities with a population greater than 200,000 where a high proportion of the residents are in professional or managerial positions; and extreme rural — areas with a population under 10,000 where most of the residents are farmers or farm workers.

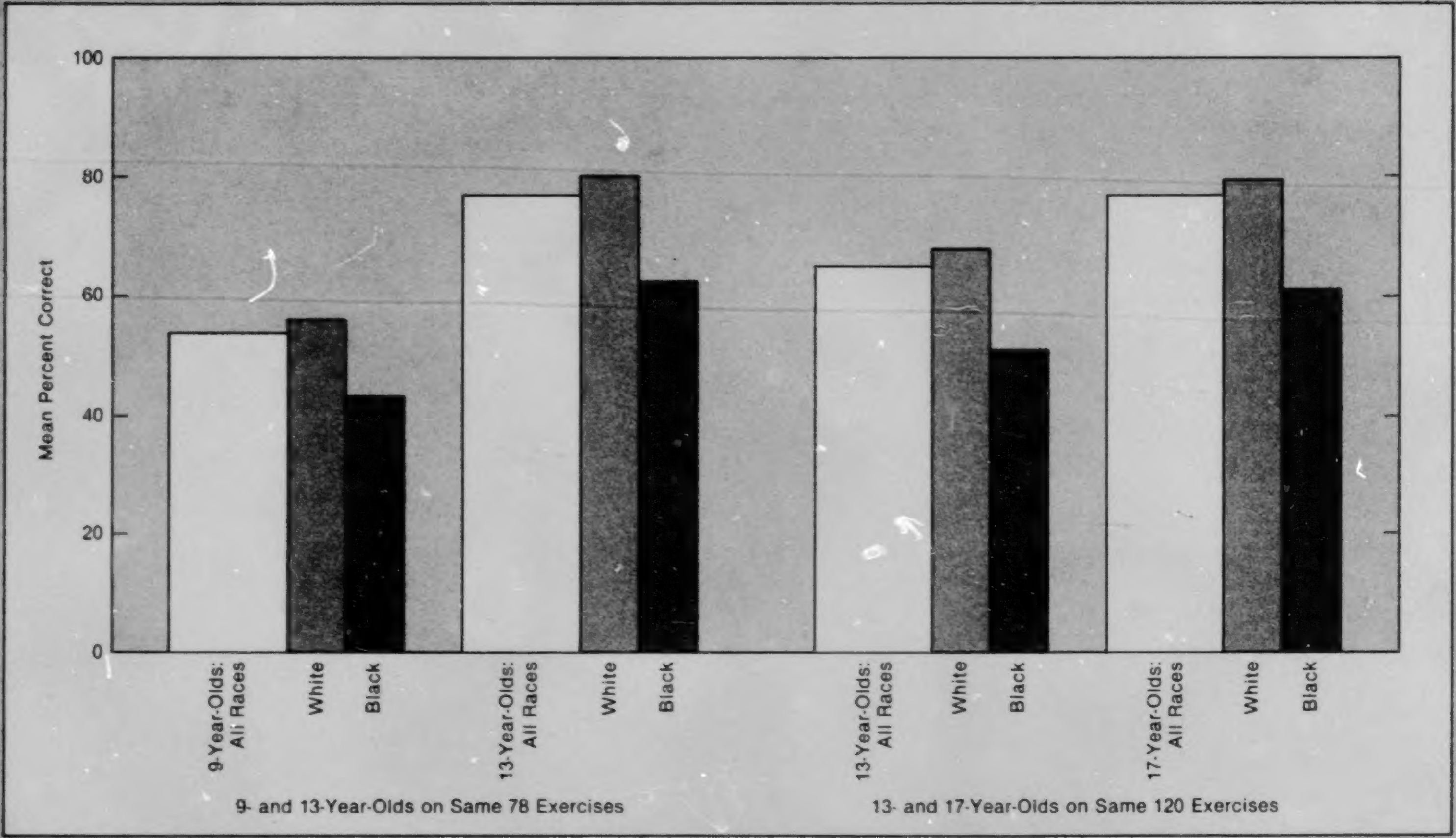
[2] Three levels of parental education are defined: Those whose parents did not graduate from high school; those who have at least one parent who graduated from high school; and those who have at least one parent with some post-hgih school education.

Note: Percent correct on identical mathematics items for assessments in 1973 and 1978.

Source: U.S. Department of Education, National Institute of Education, National Assessment of Educational Progress, *Mathematical Technical Report: Summary Volume*, April 1980.

Chart IV-4: Mathematical knowledge of 9-, 13-, and 17-year olds: 1978

Although the gap appears to be narrowing between assessments, the mathematical knowledge of black students was substantially lower than that of white students in 1978.



Source: The Condition of Education, NCES, 1982, p. 187.

Table IV-4: Mean percent correct responses of 9-, 13-, and 17-year-olds on the same mathematics exercises, by race: 1978

Race	9-Year-Olds	13-Year-Olds	Yearly Progression Rate[2]	13-Year-Olds	17-Year-Olds	Yearly Progression Rate[2]
Mathematical Applications						
	Same 33 Items			Same 83 Items		
All Races .	36.4	64.8	15.5	38.3	55.1	9.5
White . .	38.6	68.1	15.2	40.8	58.4	9.4
Black . .	26.7	48.5	16.1	25.6	35.3	8.4
Mathematical Knowledge[1]						
	Same 78 Items			Same 120 Items		
All Races .	53.4	77.0	9.6	64.8	76.9	4.4
White . .	55.8	80.0	9.4	67.7	79.6	4.1
Black . .	42.9	62.2	9.7	50.7	60.9	4.7
Mathematical Skills[1]						
	Same 98 Items			Same 218 Items		
All Races .	41.6	69.6	13.7	48.6	66.1	8.0
White . .	43.9	73.1	13.6	51.8	69.2	7.5
Black . .	30.6	51.9	14.1	32.4	47.2	9.9

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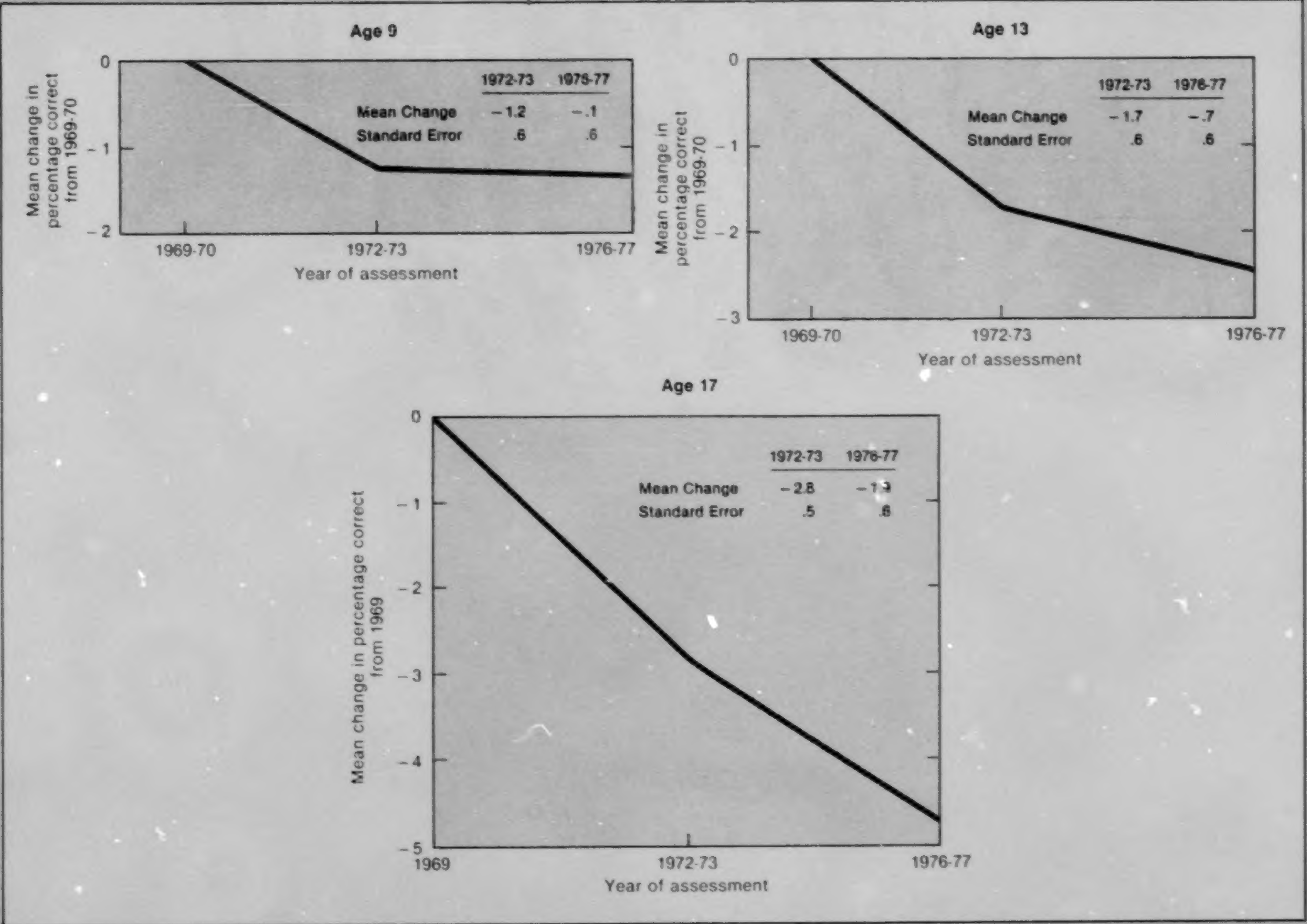
[1] Assessment areas include the following cognitive abilities: Mathematical knowledge — ability to recall and recognize facts, definitions and symbols; mathematical skill — ability to perform mathematical computations, make measurements, read graphs and tables, perform geographic and algebraic manipulations and estimate answers to computations and measurements; mathematical application — ability to solve typical textbook problems, solve nonroutine problems, estimate answers, and use mathematics in reasoning and making judgements.

[2] Yearly progression rate in mean percent correct responses between younger and older age groups is determined by using the annual compound growth rate formula $r = \sqrt[t]{R_o/R_y} - 1$; where t = number of years difference in age (4), R_o = score for older age group, and R_y = score for younger age group.

Source: U.S. Department of Education, National Institute of Education, National Assessment of Educational Progress, *Mathematical Knowledge and Skills: Selected Results from the Second Assessment of Mathematics*, Report No. 09-MA-02, August 1979, *Mathematical Applications: Selected Results from the Second Assessment of Mathematics*, Report No, 09-MA-03, August 1979.

Chart IV-5: Changes in science achievement for 9-, 13- and 17-year olds: 1969-77

Overall achievement in science declined for all age groups at every test interval. All three declines in the first National Assessment and Educational Progress NAEP Testing interval were statistically significant (at the .05 level) while only that for 17-year-olds was significant in the second interval.



Age 9

	1972-73	1976-77
Mean Change	− 1.2	− .1
Standard Error	.6	.6

Age 13

	1972-73	1976-77
Mean Change	− 1.7	− .7
Standard Error	.6	.6

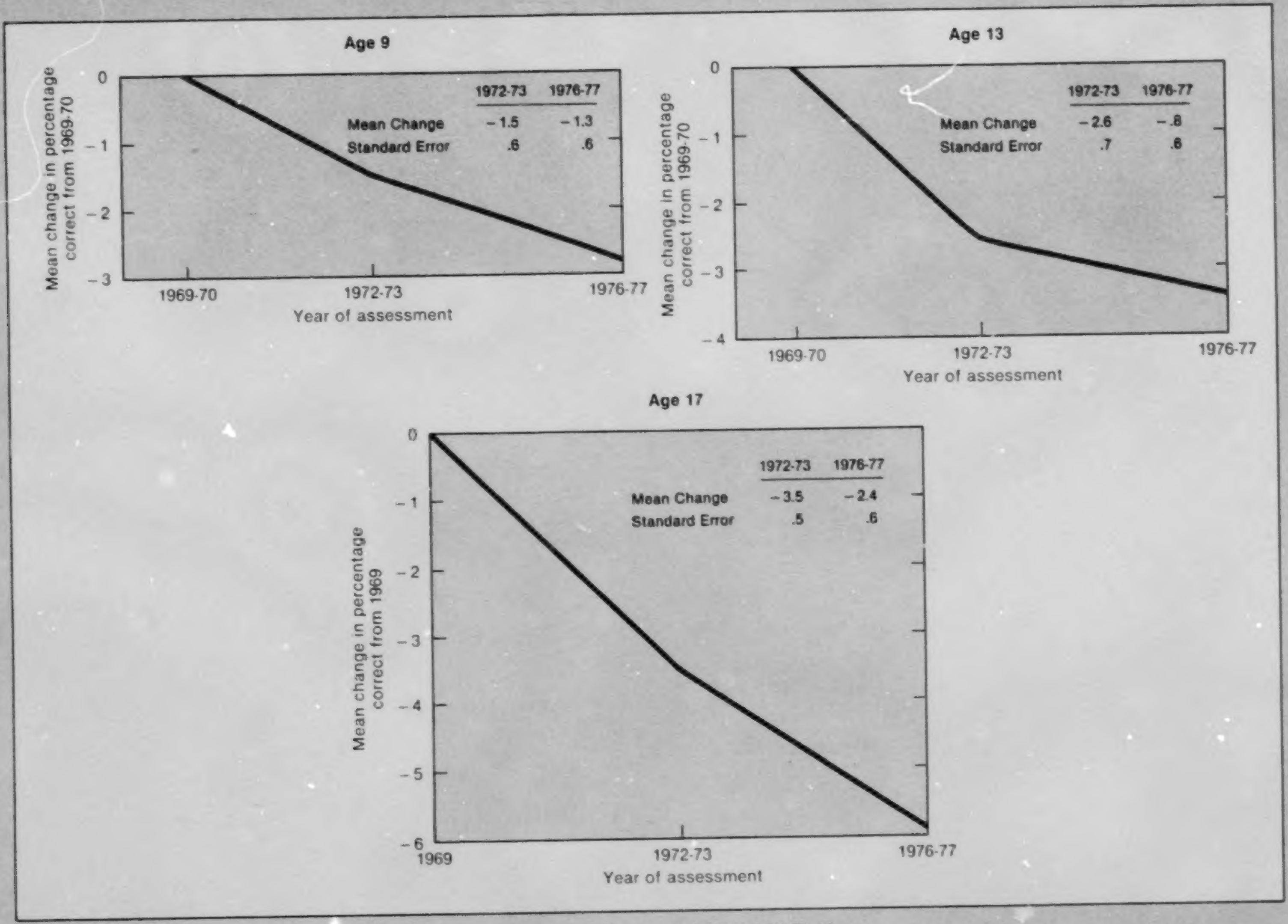
Age 17

	1972-73	1976-77
Mean Change	− 2.8	− 1.9
Standard Error	.5	.6

Source: National Assessment of Educational Progress, *Three National Assessments of Science: Changes in Achievement, 1969-77*, p. 6.

Chart IV-6: Changes in physical science achievement 1969-77 for 9-, 13- and 17-year olds: National Assessment of Educational Progress

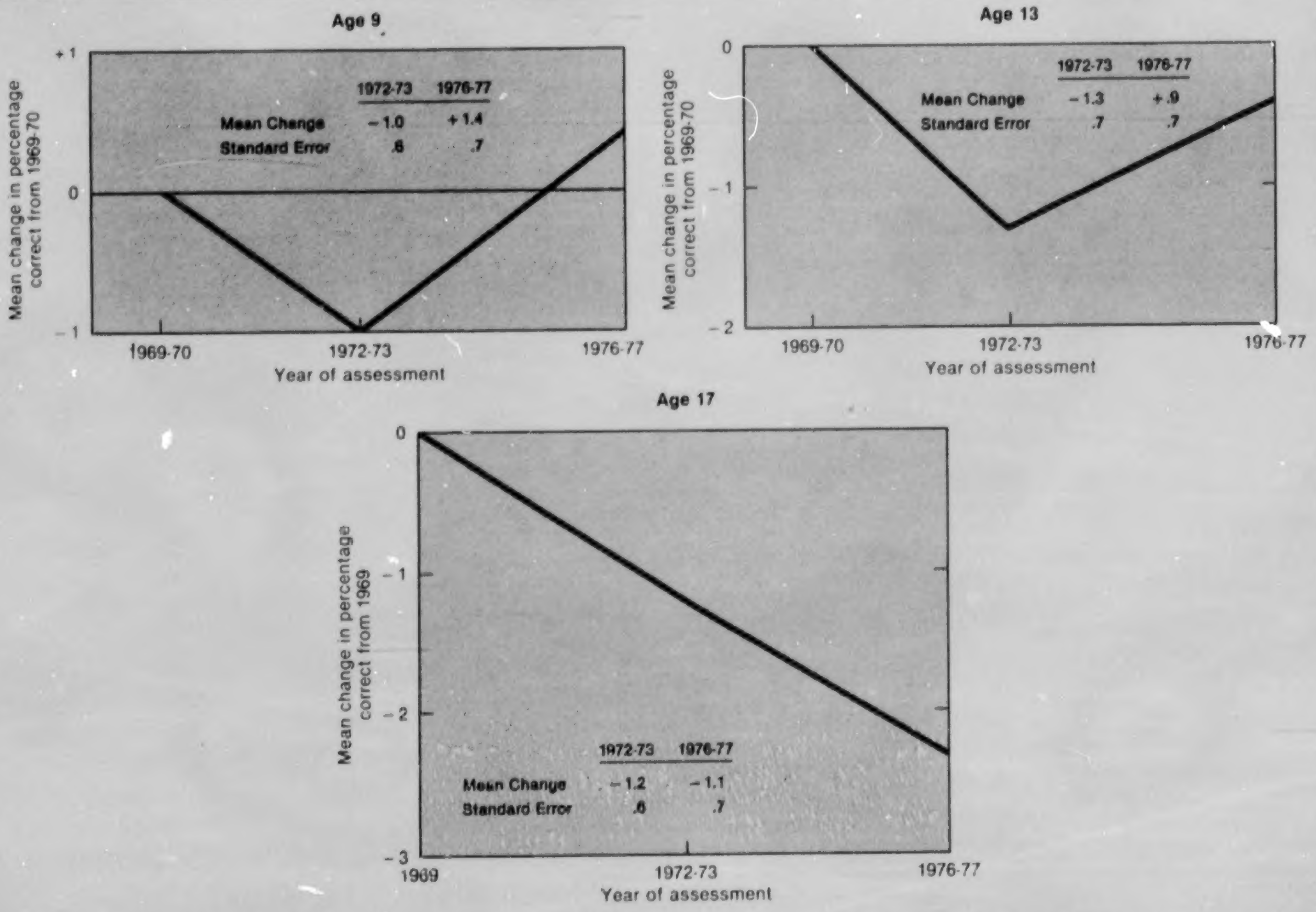
Achievement in the physical sciences declined for all age groups at every test interval. All three declines in the first interval were statistically significant (at the .05 level) while the declines for the nine-year-olds and 17-year-olds were significant in the second interval.



Source: National Assessment of Educational Progress, *Three National Assessments of Science: Changes in Achievement, 1969-77*, p. 8.

Chart IV-7: Changes in biology achievement 1969-77 for 9-, 13- and 17-year-olds: National Assessment of Educational Progress

Although it appears that achievement in the biological sciences declined for all three age groups in the first interval and continued to decline for 17-year-olds while improving for the younger groups, the only statistically significant change (at the .05 level) occurred for the 17-year-olds between 1969-70 and 1972-73.



Source: National Assessment of Educational Progress, *Three National Assessments of Science: Changes in Achievement, 1969-77.*, p. 7.

Table IV-5, 6, 7: Change in science achievement, 1969-77 for 9-, 13-, and 17-year olds: National Assessment of Educational Progress

	1969-70 and 1972-73 items			1972-73 and 1976-77 items		
Item	1969-70[1]	1972-73	Change	1972-73	1976-77	Change
9-year olds						
All exercises						
Mean percent correct	60.97	59.81	* – 1.17	52.33	52.24	– 0.09
Standard error	.35	.44	.56	.42	.45	.62
Physical science						
Mean percent correct	56.70	55.21	* – 1.49	47.50	46.24	* – 1.26
Standard error	.38	.48	.61	.42	.44	.61
Biological science						
Mean percent correct	70.35	69.33	– 1.02	57.85	59.22	1.38
Standard error	.38	.40	.55	.45	.55	.71
13-year-olds						
All exercises						
Mean percent correct	60.18	58.47	* – 1.71	54.47	53.80	– .67
Standard error	.40	.47	.62	.40	.42	.58
Physical science						
Mean percent correct	59.67	57.10	* – 2.58	50.43	49.59	– .84
Standard error	.42	.51	.66	.41	.41	.58
Biological science						
Mean percent correct	60.89	59.63	– 1.26	61.08	61.99	.92
Standard error	.51	.50	.71	.45	.50	.67
17-year-olds						
All exercises						
Mean percent correct	45.25	42.46	* – 2.79	48.41	46.49	* – 1.92
Standard error	.34	.32	.47	.37	.44	.57
Physical science						
Mean percent correct	42.87	39.34	* – 3.52	46.83	44.45	* – 2.38
Standard error	.38	.35	.52	.37	.43	.57
Biological science						
Mean percent correct	52.30	51.12	* – 1.18	53.30	52.19	– 1.12
Standard error	.42	.42	.59	.49	.50	.70

*Change statistically significant at the 0.05 level.

[1] Year of assessment for 17-year-olds is 1969.

Source: Dearman, Nancy B., and Plisko, Valena White, *The Condition of Education, 1979 Edition*, p. 178.

Chart IV-8: Changes in mathematical achievement, 1973-78, for 9-, 13-, and 17-year-olds: National Assessment of Educational Progress

Overall mathematics achievement declined for all three age groups with the decline for the two older groups being statistically significant at the .05 level, with the exception of the knowledge items. Where there were no statistically significant differences, the older the group the steeper the decline in each of the assessed areas.

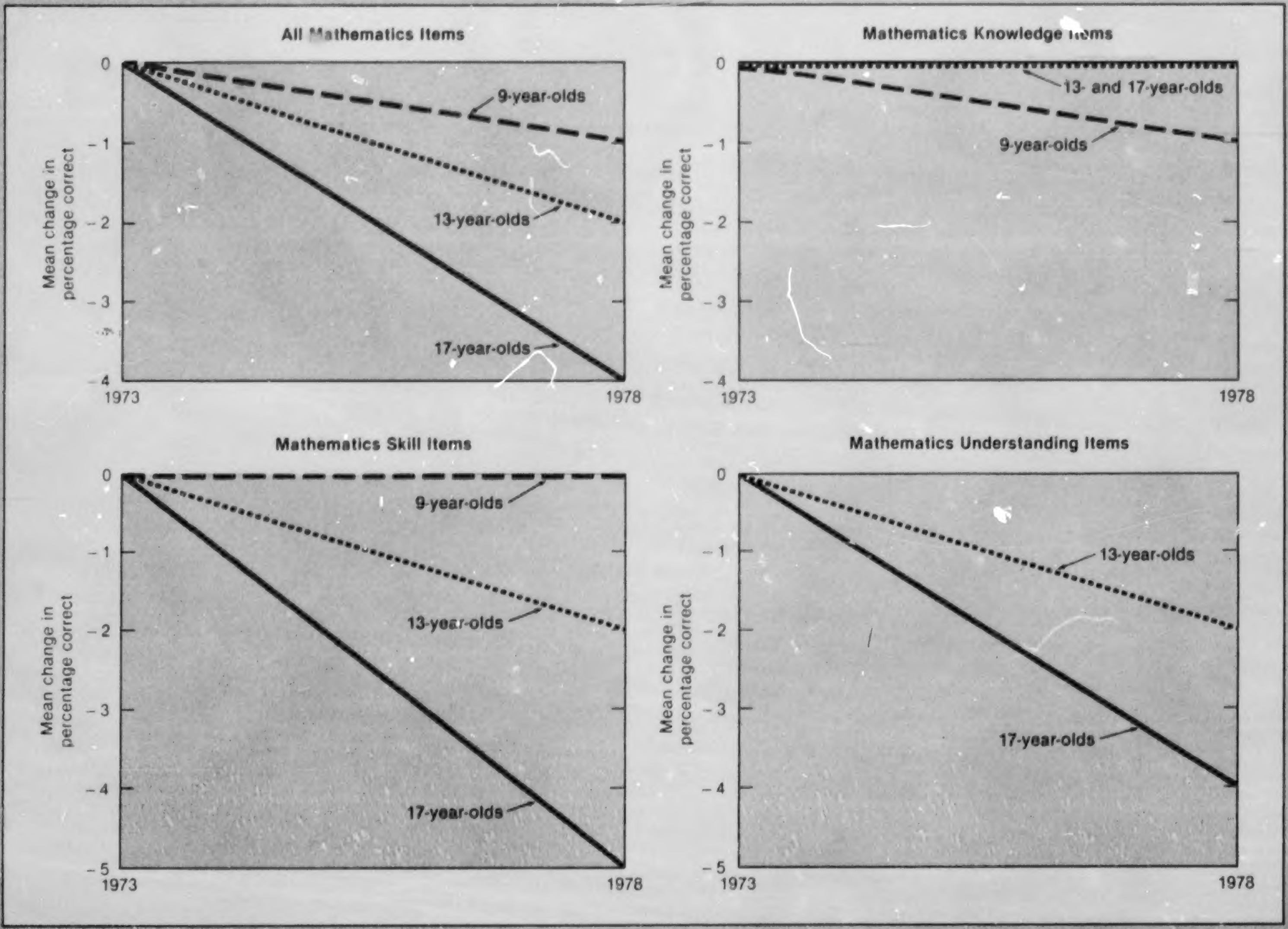
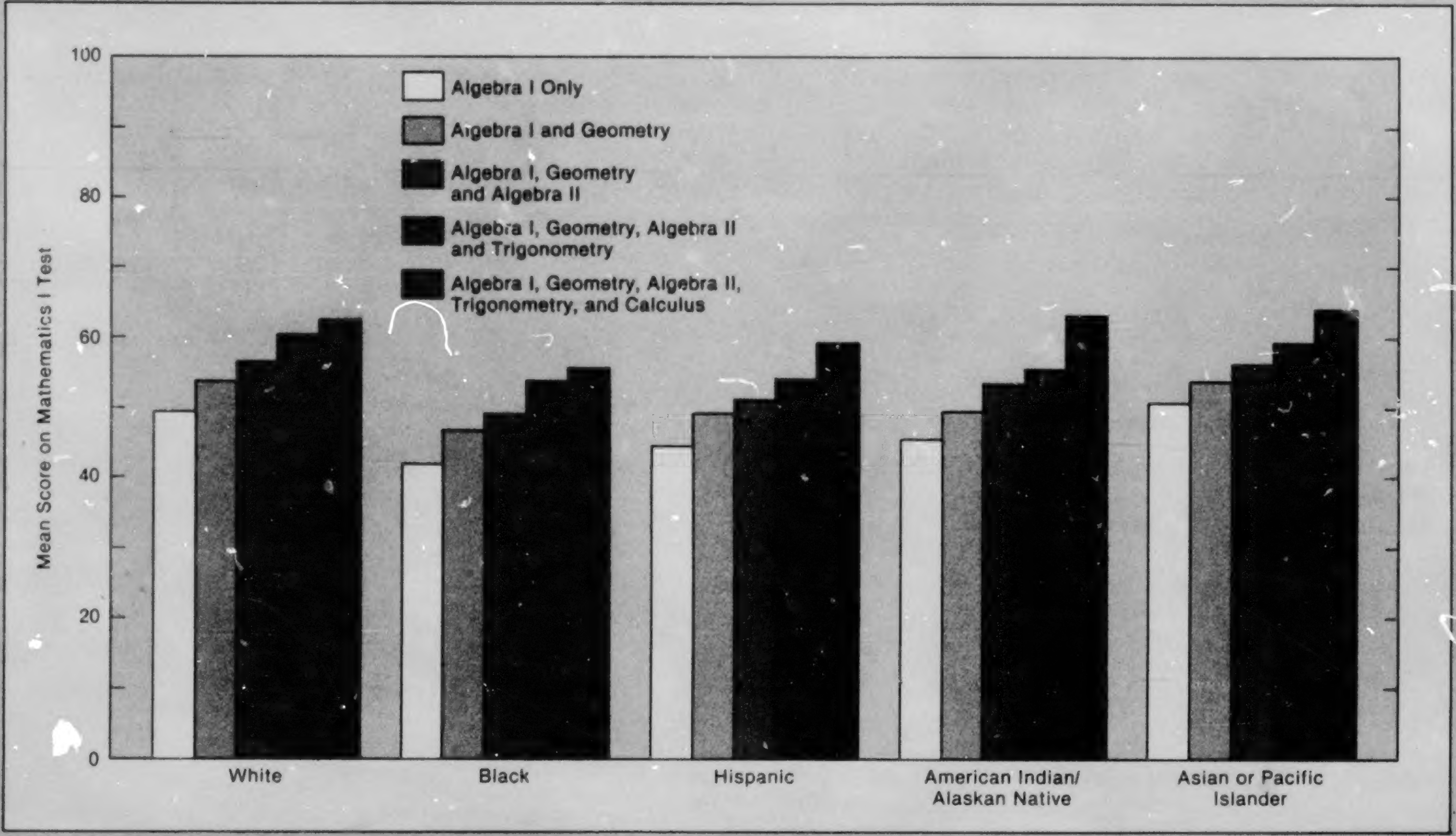


Chart IV-9: Mathematics test scores of high school seniors related to types of courses taken

Within each racial/ethnic group, high school seniors who had completed increasingly complex mathematics courses performed significantly better on the mathematics achievement test than students who had completed lower-level courses only.



Source: The Condition of Education, NCES, 1982, p. 197.

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Table IV-8: Mean mathematics test scores of high school seniors, by types of mathematics courses taken and racial/ethnic group: 1980

Characteristic	Algebra I Only		Algebra I and Geometry		Algebra I Geometry, and Algebra II		Algebra I, Geometry, Algebra II, and Trigonometry		Algebra I, Geometry Algebra II, Trigonometry, and Calculus	
	Math Test I	Math Test II	Math Test I	Math Test II	Math Test I	Math Test II	Math Test I	Math Test II	Math Test I	Math Test II
	Mean Test Score[1]									
White	49.44	48.30	53.74	52.23	56.55	55.02	60.07	59.21	62.65	62.64
Black	41.85	44.69	46.63	47.36	48.90	49.07	53.46	53.26	55.59	56.22
Hispanic	44.39	45.74	49.08	49.29	51.06	50.63	54.09	53.92	59.59	57.56
American Indian or Alaskan Native	45.54	45.70	49.88	49.95	53.35	51.95	55.59	53.20	63.06	59.36
Asian or Pacific Islander	50.80	51.30	53.90	54.97	56.25	58.10	59.47	60.50	63.95	63.98

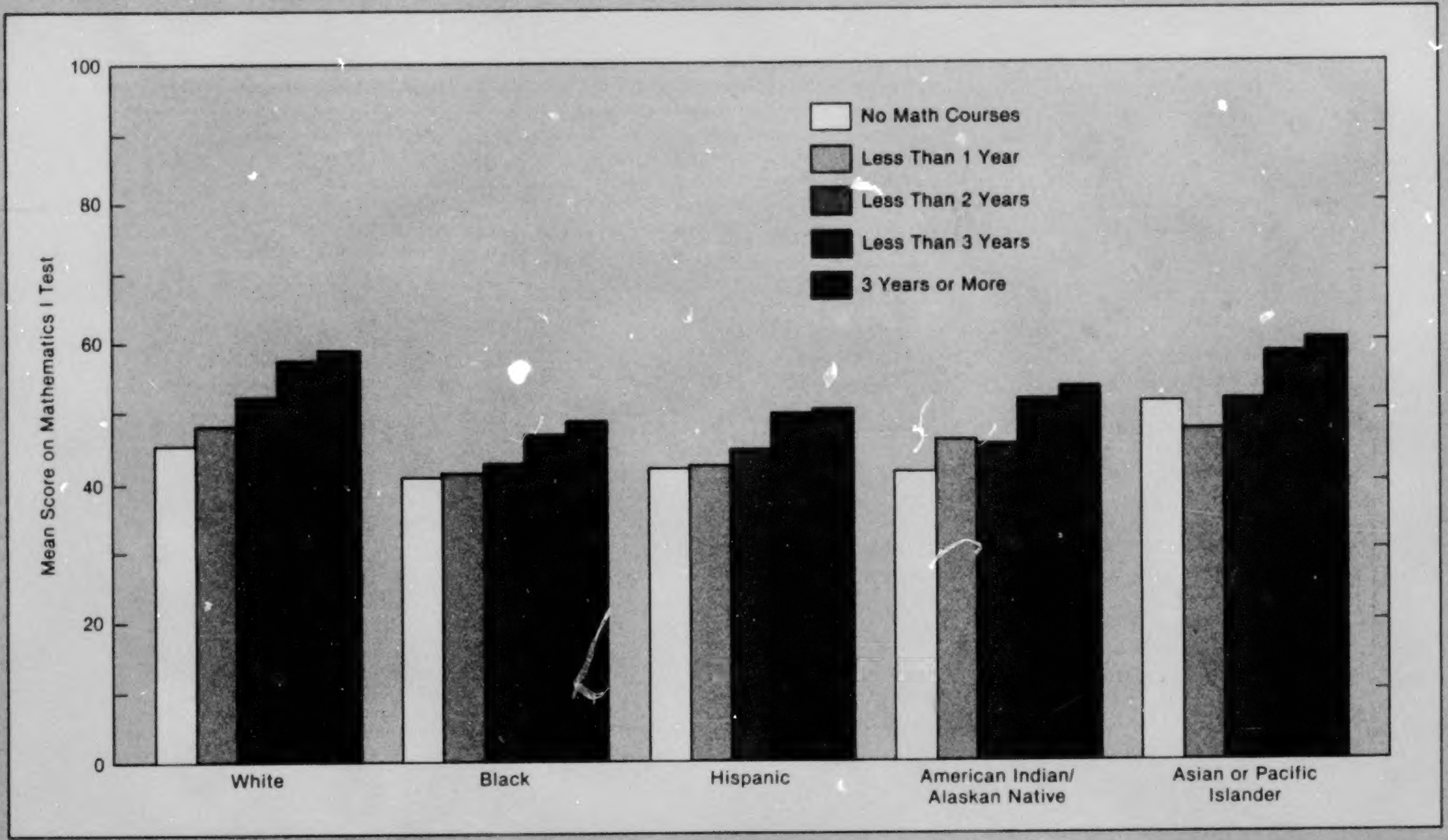
[1] Mathematics test I was designed to measure basic competence in quantitative skills, while mathematics test II measured the skills at a higher level. Because each set of test scores is standardized, comparisons can only be made within each test.

Note: Scores are standardized to a mean of 50 points and a standard deviation of 10 points.

Source: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Study, unpublished tabulations.

Chart IV-10: Mathematics test scores of high school seniors related to years of coursework

Additional years of mathematics were associated with higher mathematics test scores, although white and Asian students with fewer years of math often performed better than other racial/ethnic groups with more years.



Source: The Condition of Education, NCES, 1982, p. 195.

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Table IV-10: Mean mathematics test scores of high school seniors, by number of years of mathematics taken, racial/ethnic group, sex, and socioeconomic status: 1980

Characteristic	Mathematics Test I Scores[1]					Mathematics Test II Scores[1]				
	Number of Years of Mathematics Taken					Number of Years of Mathematics Taken				
	None	Less Than 1 Year	Less Than 2 Years	Less Than 3 Years	3 Years or More	None	Less Than 1 Year	Less Than 2 Years	Less Than 3 Years	3 Years or More
	Mean Test Score									
Racial/Ethnic Group:										
White	45.66	48.07	52.39	57.54	58.87	45.04	47.41	51.09	56.52	58.60
Hispanic	41.92	42.06	44.44	49.92	50.27	45.04	44.53	46.32	50.22	51.69
Black	40.51	41.13	42.62	46.80	48.88	42.71	43.60	45.50	47.49	49.90
American Indian or Alaskan Native	41.13	45.96	45.68	51.97	53.30	41.57	45.08	46.77	50.71	50.06
Asian or Pacific Islander	51.27	47.27	51.58	58.30	60.16	44.94	46.05	52.46	59.82	62.41
Sex:										
Male	45.19	47.85	51.41	57.45	58.39	45.45	47.62	50.72	56.69	58.24
Female	45.08	46.65	50.36	54.90	56.21	44.60	46.43	49.81	54.13	56.33
Socioeconomic Status:										
Low	44.38	44.46	46.12	50.66	51.81	45.06	45.40	46.62	50.39	52.27
Middle	45.37	47.90	51.16	56.07	57.11	44.42	47.27	50.27	55.05	57.20
High	47.47	49.83	54.69	59.01	60.38	46.84	48.61	53.21	58.26	59.99

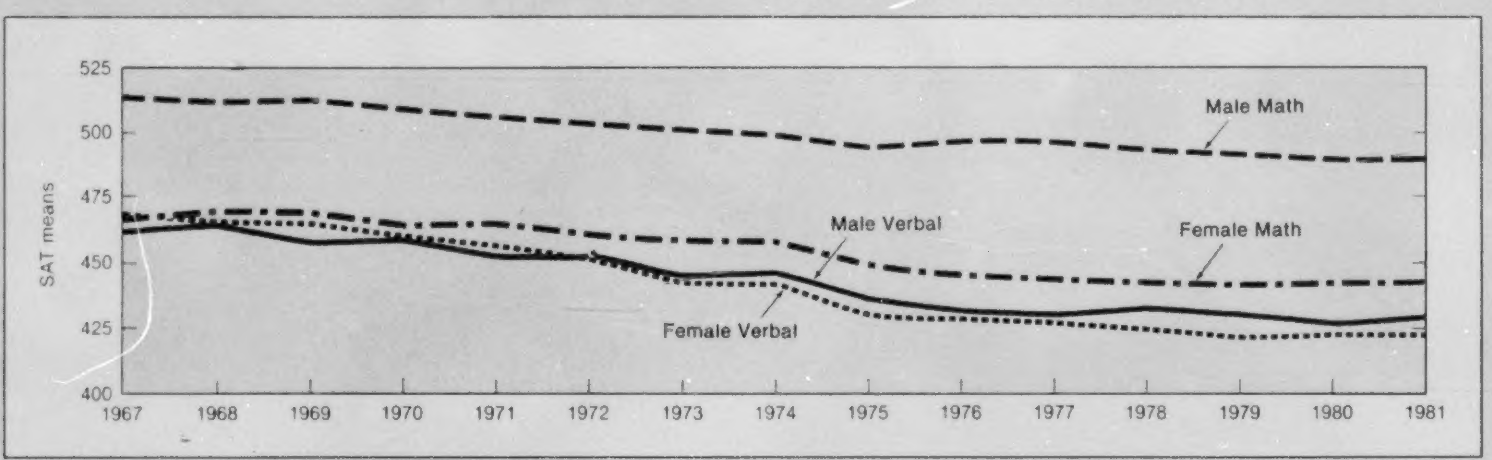
[1] Mathematics test I was designed to measure basic competence in quantitative skills, while mathematics test II measured the skills at a higher level. Because each set of test scores is standardized, comparisons can only be made within each test.

Note: Scores are standardized to a mean of 50 points and a standard deviation of 10 points.

Source: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Study, unpublished tabulations.

Chart IV-11: Scholastic Aptitude Test (SAT) score averages for college-bound seniors, 1967-81

For 1981, the average verbal and mathematical scores were identical to the averages of 1980 predecessors. For the first time since the score decline began, neither the verbal nor mathematical score averages declined from the previous year. Men outperform women on the verbal test with average scores of 430 versus 418. This difference by sex has widened from 3 points in 1976 to 12 points in 1981. Part of this difference may be due to the larger number of women taking the test. In the mathematical section, average scores for males increased one point from the previous year to 492, and those for females remained the same as in the previous two years (443). Between 1973 and 1981, the difference in male and female averages widened from 42 points to 49 points. This difference is even greater for students with an outstanding high school record; men in the top tenth of their class have a mathematical average that is 63 points higher than that of women in the top tenth of their class.



Source: Admissions testing program of the college board, *National Report, College Bound Seniors*, 1979, 1980, 1981, p. 5.

Table IV-11: SAT score averages for college-bound seniors, 1967-81*

SAT	Mathematical			Verbal		
	Male	Female	Total	Male	Female	Total
1967	514	467	492	463	468	466
1968	512	470	492	464	466	466
1969	513	470	493	459	466	463
1970	509	465	488	459	461	460
1971	507	466	488	454	457	455
1972	505	461	484	454	452	453
1973	502	460	481	446	443	445
1974	501	459	480	447	442	444
1975	495	449	472	437	431	434
1976	497	446	472	433	430	431
1977	497	445	470	431	427	429
1978	494	444	468	433	425	429
1979	493	443	467	431	423	427
1980	491	443	466	428	420	424
1981	492	443	466	430	418	424

*The averages for 1967 through 1971 are estimates of the averages that would have been reported for college-bound seniors of those years if such reports had been produced.

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1979*, p. 5; *National Report, College Bound Seniors, 1980*, p. 5.; *National Report, College Bound Seniors, 1981*, p. 5.

Chart IV-12: Schclastic Aptitude Test (SAT) score averages for college-bound seniors

From 1973 to 1981, the national mean SAT verbal and math scores dropped from 445 and 481 to 424 and 466, respectively. During the same time period, among college bound who intended to major in biological science, engineering, math and physical science, SAT verbal and math scores remained above the average for all college-bound seniors.

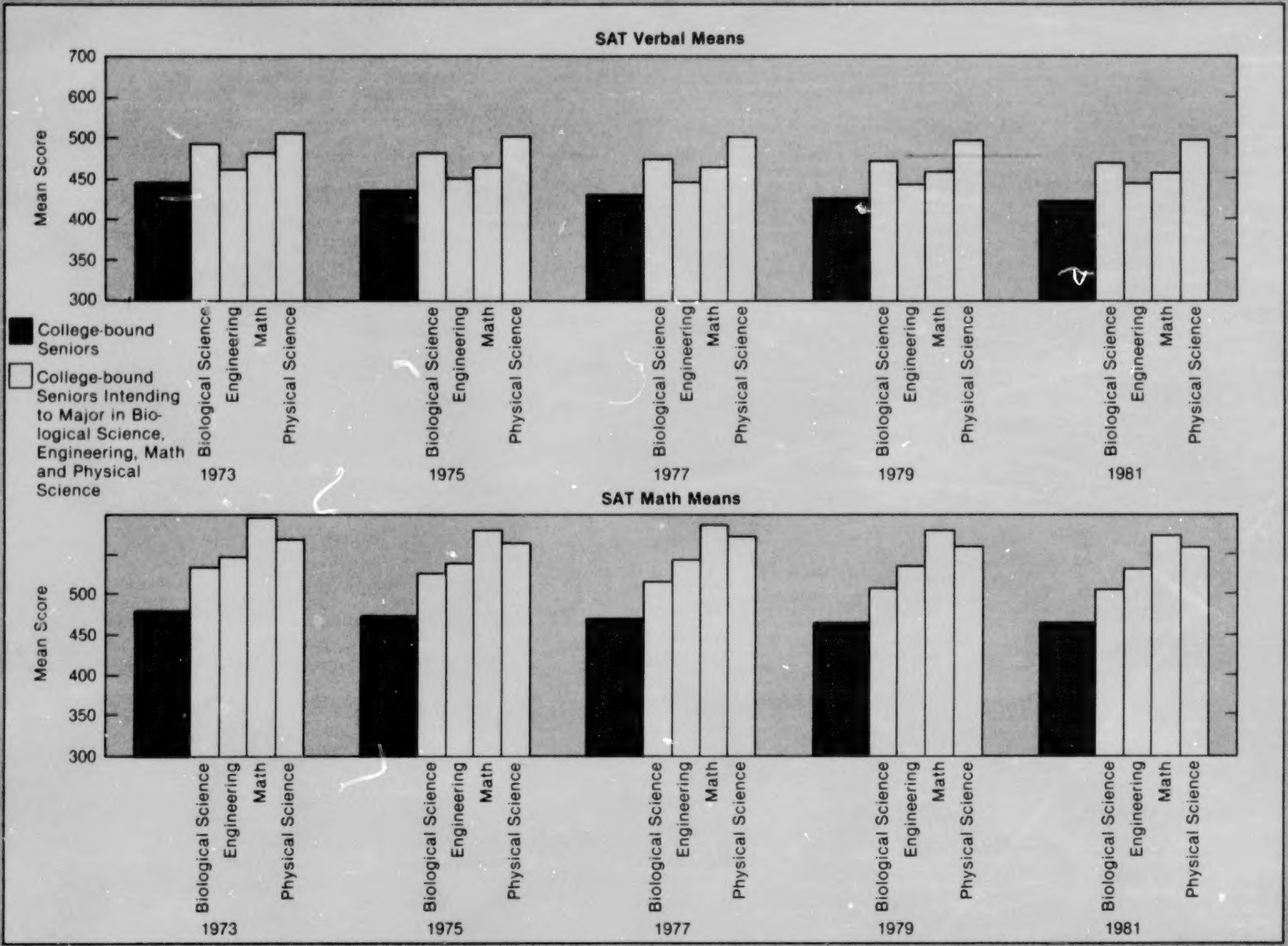


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Table IV-12: Scholastic Aptitude Test (SAT) scores of college-bound seniors, by intended area of study: 1973 to 1981

Intended Area of Study	1973		1975		1977		1979		1981	
	Verbal	Math	Verbal	Math	Verbal	Math	Verbal	Math	Verbal	Math
	Mean Test Score									
National Total	445	481	434	472	429	470	427	467	424	466
Art and Humanities	—	—	—	—	444	460	436	452	434	453
Architecture/Environmental Design	438	515	430	507	425	505	418	495	414	489
Art	440	451	435	445	412	425	404	421	403	421
English/Literature	500	481	488	465	504	478	505	478	507	482
Foreign Language	491	498	481	486	481	483	475	476	474	477
Music	465	487	448	464	445	463	437	456	435	454
Philosophy and Religion	479	500	469	484	467	487	465	482	463	481
Theater Arts	—	—	—	—	447	438	437	433	439	436
Biological Sciences and Related Areas	—	—	—	—	438	479	435	472	433	472
Agriculture	427	471	423	459	418	457	408	443	404	440
Biological Sciences	493	533	481	525	475	515	472	507	471	504
Forestry/Conservation	—	—	—	—	426	467	420	456	418	452
Health and Medical	—	—	—	—	433	474	430	469	428	469
Nursing and Health	419	444	410	444	—	—	—	—	—	—
Business, Commerce, and Communication	—	—	—	—	412	454	408	448	406	446
Business and Commerce	409	463	406	461	402	453	400	447	398	446
Communications	476	483	458	461	459	460	448	449	443	446
Physical Sciences and Related Areas	—	—	—	—	454	549	448	535	443	527
Computer Science/Systems Analysis	—	—	—	—	422	505	419	498	416	492
Engineering	460	548	450	541	448	546	445	536	446	534
Mathematics	481	595	463	580	464	588	459	580	456	572
Physical Sciences	505	570	501	565	500	572	498	561	498	558
Social Sciences and Related Areas	—	—	—	—	432	453	429	449	429	449
Education	418	449	405	434	400	426	392	420	391	418
Ethnic Studies	—	—	—	—	381	396	372	386	381	395
Geography	—	—	—	—	421	473	438	481	422	474
History and Cultures	—	—	—	—	478	474	478	471	482	472
Home Economics	413	441	409	442	399	428	389	417	383	411
Library Science	—	—	—	—	478	453	476	448	464	431
Military Science	—	—	—	—	435	489	434	481	433	474
Psychology	—	—	—	—	444	455	435	447	433	447
Social Sciences	476	490	465	476	456	474	455	472	456	474
Miscellaneous	—	—	—	—	431	473	420	458	420	459
Other	—	—	—	—	422	458	396	430	395	431
Trade and Vocational	400	450	370	405	357	400	353	394	350	391
Undecided	—	—	—	—	448	491	441	480	440	480
Other/Undecided	446	489	438	477	—	—	—	—	—	—

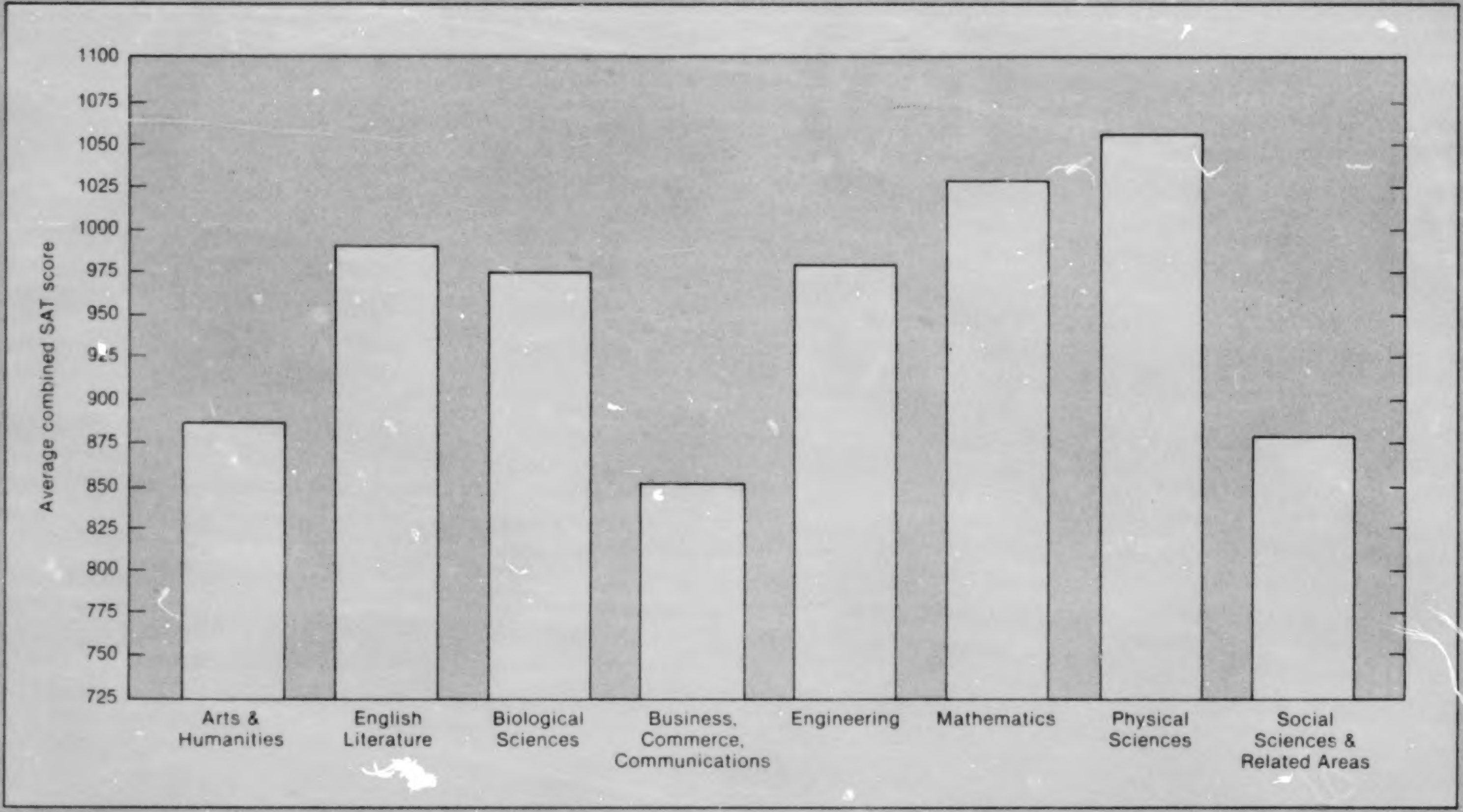
—Not Available.

Note: 1973 and 1975 data are based on a 10 percent random sample.

Source: College Entrance Examination Board, *A Summary of SAT Score Statistics for College Board Candidates, 1975, National Report, College-Bound Seniors, 1979,* 1981 and unpublished tabulations of the College Board, copyright.

Chart IV-13: Intended undergraduate fields of college-bound seniors, by combined average SAT scores, 1980-81

College-bound seniors planning to study the physical sciences and mathematics have higher SAT scores on the average than those planning to major in other fields.



Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1981*, p. 18.

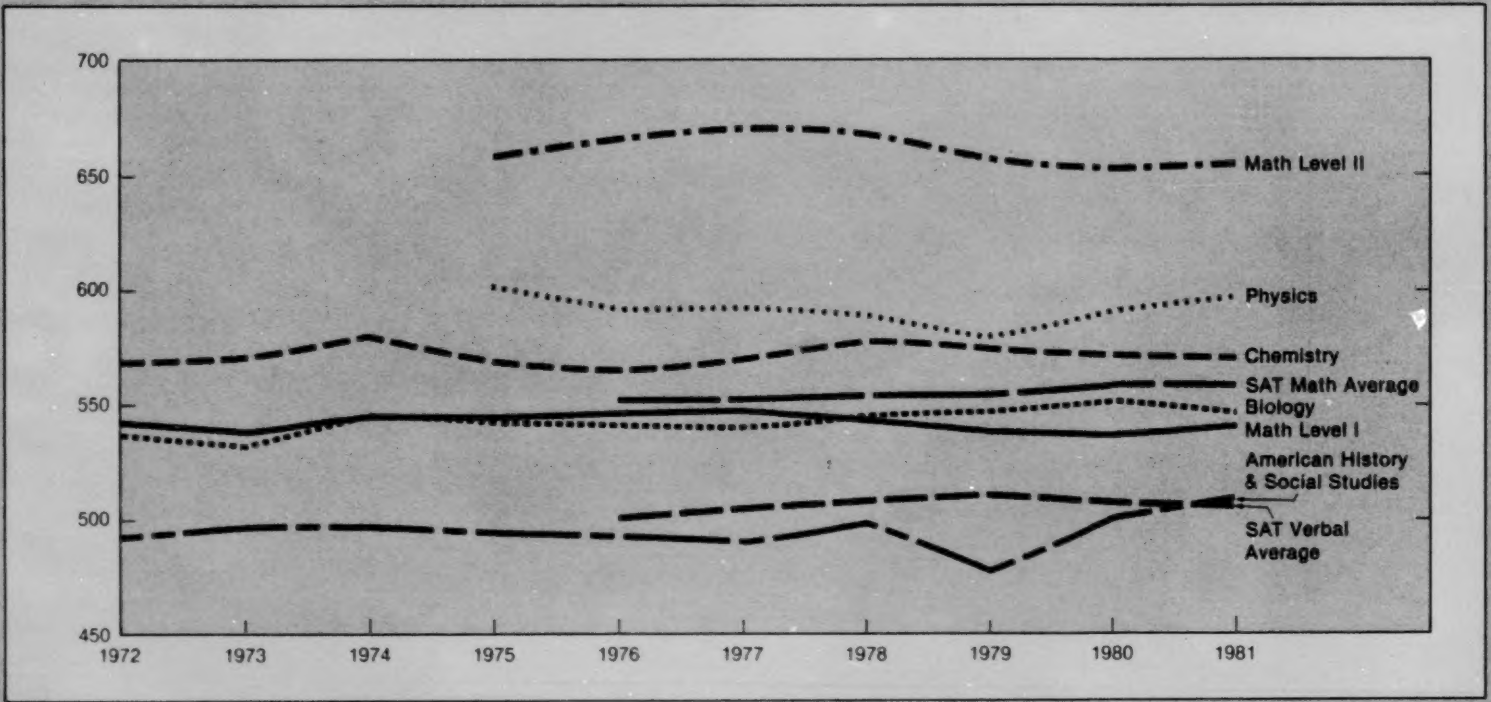
Table IV-13: Intended undergraduate fields of college bound seniors by SAT scores, 1980-81

Number Responding	SAT Verbal Mean	SAT Math Mean	Selected SAT Totals
	906,195 Total		
Arts and Humanities	434	453	887
Architecture/Environmental Design	414	489	903
Art	403	421	824
English/Literature	507	482	989
Foreign Languages	474	477	951
Music	435	454	889
Philosophy and Religion	463	481	944
Theater Arts	439	436	875
Biological Sciences and Related Areas	433	472	905
Agriculture	404	440	844
Biological Sciences	471	504	975
Forestry/Conservation	418	452	870
Health and Medical	428	469	897
Business, Commerce, and Communications	406	446	852
Business and Commerce	398	446	844
Communications	443	446	889
Physical Sciences and Related Areas	443	527	970
Computer Science/Systems Analysis	416	492	908
Engineering	446	534	980
Mathematics	456	572	1028
Physical Sciences	498	558	1056
Social Sciences and Related Areas	429	449	878
Education	391	418	809
Ethnic Studies	381	395	776
Geography	422	474	896
History and Cultures	482	472	954
Home Economics	383	411	794
Library Science	464	431	895
Military Science	433	474	907
Psychology	433	447	880
Social Sciences	456	474	930
Miscellaneous	420	459	879
Other	395	431	826
Trade and Vocational	350	391	741
Undecided	440	480	920

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors*, 1981, p. 18.

Chart IV-14: Admissions Testing Program (ATP) achievement test score averages, 1972-81

The average Achievement Test scores range from 526 (1972) to 532 (1981). The number of students taking the Achievement Tests, however, decreased 41% between 1972 and 1981. Also, the average scores for physics tests increased significantly from 1979 to 1981.



Source: Admissions testing program of the college board, *National Report, College Bound Seniors*, 1977, 1978, 1979, 1980, 1981

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Table IV-14: Admissions Testing Program (ATP) achievement test score averages, 1972-81

	1972 AV	1973 AV	1974 AV	1975 AV	1976 AV	1977 AV	1978 AV	1979 AV	1980 AV	1981 AV
Average for all Achievement Tests	526	527	533	531	538	533	531	529	532	532
English Composition	516	517	517	515	532	516	512	514	518	512
Mathematics Level I	541	537	545	545	546	547	541	537	536	539
American History and Social Studies	492	498	498	494	493	492	496	480	501	508
Biology	535	532	545	544	543	543	544	547	551	546
Chemistry	568	572	581	569	567	574	577	575	573	571
Mathematics Level II	n/a	n/a	n/a	660	665	666	665	657	653	654
French	539	544	560	553	553	553	552	554	550	546
Spanish	530	539	560	544	547	535	554	542	524	529
Literature	n/a	n/a	n/a	522	525	526	521	522	524	517
Physics	n/a	n/a	n/a	601	592	593	591	580	592	595
German	n/a	n/a	n/a	547	555	551	553	550	552	551
European History and World Cultures	n/a	n/a	n/a	521	531	526	507	516	539	544
Latin	n/a	n/a	n/a	514	524	517	508	524	529	548
Hebrew	n/a	n/a	n/a	577	579	581	589	588	600	602
Russian	n/a	n/a	n/a	540	559	575	587	613	622	642
Average SAT scores for takers of Achievement tests*										
Verbal					501	504	507	508	506	505
Mathematics					553	553	554	554	557	557

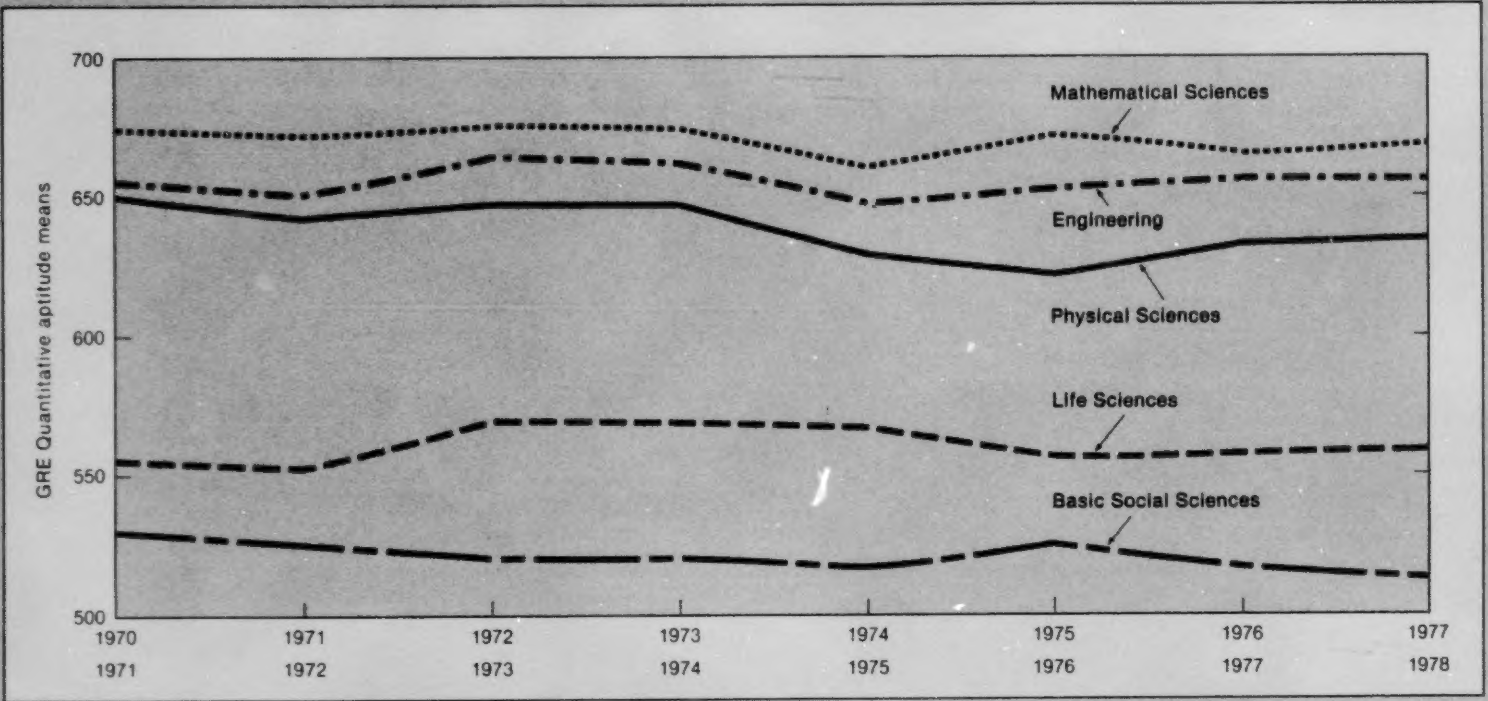
AV = Mean

*Data not computed prior to 1976. Data for 1976 are estimated from scores of individual achievement tests for that year.

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors, 1977*, p. 8, *1978*, pp. 13-14, *1979*, pp. 13-14; *IBID. 1980*, pp. 13-14, *1981*, pp. 13-14.

Chart IV-15: Graduate Record Examination quantitative aptitude mean scores for prospective graduate students in science, 1970-78

As reflected by GRE scores, there have been no significant changes in the quantitative aptitude of prospective science graduate students. However, candidates in the life sciences and basic social sciences average noticeably lower than those in other science disciplines.



Source: National Science Foundation, *Science Indicators, 1980.*

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Table IV-15: Number of students taking Admissions Testing Program (ATP) achievement tests, 1972-81

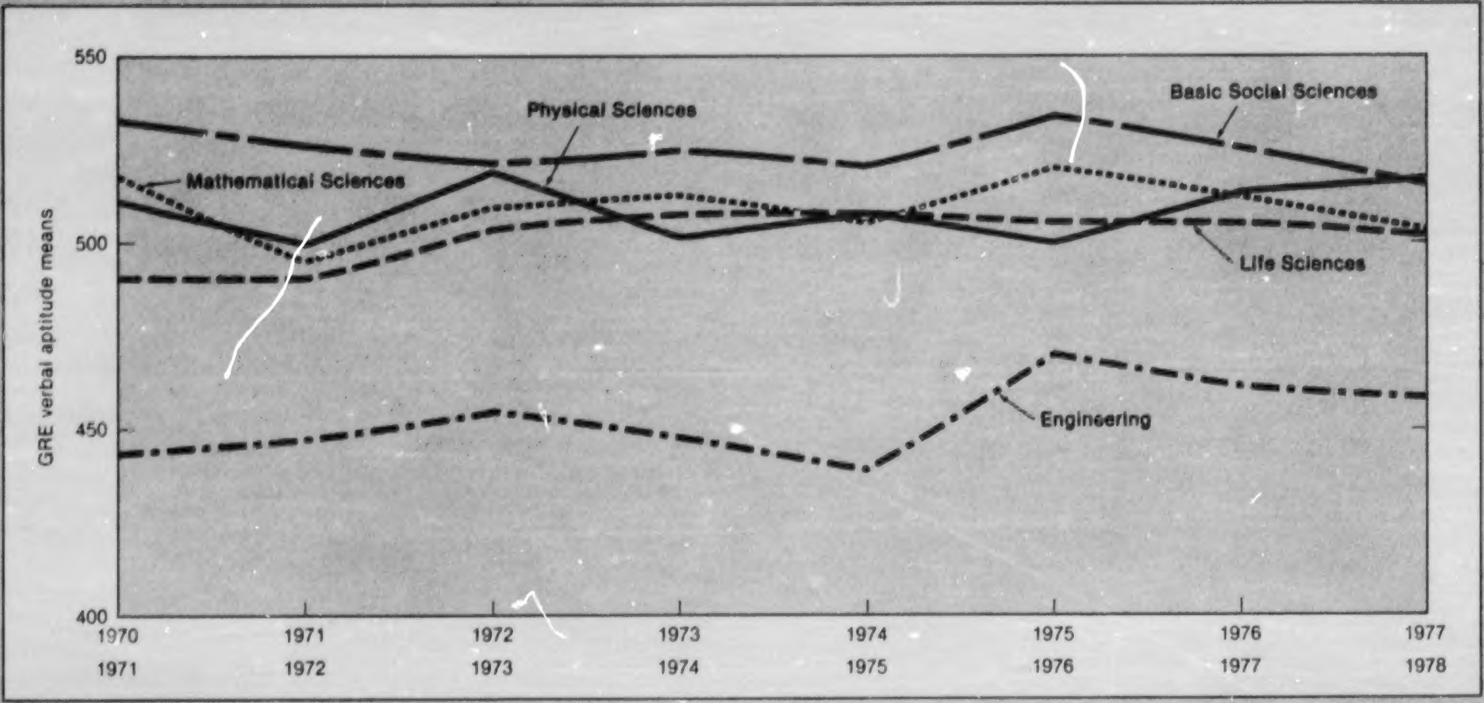
	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
English Composition	313,000*	275,196	228,300	211,852	212,796	200,539	195,173	187,266	184,714	182,939
Mathematics Level I	240,000*	210,734	172,032	158,061	158,327	149,918	146,426	145,572	146,172	145,851
American History and Social Studies	105,000*	87,179	71,289	64,089	64,139	63,111	60,687	58,005	55,987	54,717
Biology	51,000*	50,521	46,468	46,383	46,041	44,897	47,291	43,002	40,580	40,480
Chemistry	48,000*	42,863	36,521	33,056	34,294	35,009	35,007	34,159	34,473	34,494
Mathematics Level II	n/a	n/a	n/a	29,334	32,153	30,497	32,743	34,513	34,990	37,592
French	52,000*	47,475	38,240	33,868	31,087	27,298	25,673	23,621	23,823	23,239
Spanish	34,000*	33,212	27,814	26,000*	26,019	24,238	24,356	23,528	25,039	25,350
Literature	n/a	n/a	n/a	21,000*	21,523	19,284	18,281	17,012	17,158	16,405
Physics	n/a	n/a	n/a	12,000*	15,644	15,882	15,408	15,046	14,656	15,897
German	n/a	n/a	n/a	7,000*	6,312	5,650	5,524	5,154	4,801	4,682
European History and World Cultures	n/a	n/a	n/a	5,000*	3,367	2,426	3,527	3,420	3,469	3,229
Latin	n/a	n/a	n/a	2,000*	1,698	1,259	1,425	1,570	1,823	2,114
Hebrew	n/a	n/a	n/a	1,000*	732	713	624	637	543	499
Russian	n/a	n/a	n/a	500*	478	352	402	311	340	347
Average	335,000*	294,678	246,622	228,115	228,227	212,712	208,844	201,392	200,038	198,922

*Estimated

Source: Admissions Testing Program of the College Board, *National Report, College Bound Seniors*, 1977, p. 8, 1978, pp. 13-14, 1979, pp. 13-14, 1980, pp. 13-14, 1981, pp. 13-14.

Chart IV-16: Graduate Record Examination verbal aptitude mean scores for prospective graduate students in science, 1970-78

As reflected by GRE scores, there have been no significant changes in the verbal aptitude of prospective science graduate students. However, engineering candidates averaged noticeably lower than those in other science disciplines.



Source: National Science Foundation, *Science Indicators, 1980*

Table IV-16: Trends in Graduate Record Examination mean verbal and quantitative test scores by field, 1970/71 - 1977/78

Prospective field of graduate study	Aptitude Type	1970/71	1971/72	1972-73	1973/74	1974/75	1975/76	1976/77	1977/78
		Science Fields							
Physical Sciences	V	512	500	519	502	508	500	514	517
	Q	650	643	648	648	630	623	634	636
Mathematical Sciences	V	517	495	510	513	506	520	513	504
	Q	675	673	676	675	661	673	666	669
Engineering	V	444	448	455	449	440	471	462	459
	Q	656	651	665	663	649	654	657	657
Life Sciences	V	491	491	504	508	508	506	506	503
	Q	556	553	570	569	568	557	558	559
Basic Social Sciences	V	533	527	522	525	521	534	526	516
	Q	530	526	521	521	518	526	518	414
		Nonscience Fields							
Health Professions	V	500	502	509	508	502	513	507	498
	Q	496	501	508	507	513	530	527	517
Education	V	472	463	452	449	454	464	454	446
	Q	462	457	450	442	445	459	449	449
Arts and Humanities	V	546	534	537	541	542	537	543	532
	Q	494	492	493	494	490	494	502	497
Applied Social Sciences	V	492	482	484	493	488	471	477	483
	Q	480	475	475	477	464	461	465	472
Other Nonscience	V	496	490	501	498	496	507	498	486
	Q	498	500	502	495	498	509	510	504

*Note: V = verbal, Q = quantitative. Standard deviations cannot be computed for all years. For 1976/77, however, standard deviations ranged between 100 and 136.

Sources: Data for the years 1970/71 through 1974/75 are from a one-in-fifteen sample study of examinees of those years. See Robert F. Boldt, *Trends in Aptitude of Graduate Students in Science* (Princeton, N.J.: Educational Testing Service), p. 20. Mean scores for 1975/76 and 1987/77 were calculated from unpublished tabulations furnished by the Educational Testing Service, based on the test results of a high proportion of all examinees of those years. Mean scores for 1977/78 are from *A Summary of Data Collected from Graduate Record Examination Test Takers During 1977/78, Data Summary Report#3* (Princeton, N.J.: Educational Testing Service), February 1979, Tables 13, 14 and 42; pp. 42, 81-84 and 85-88.

See figure 5-6.

Source: National Science Foundation, *Science Indicators* — [illegible]

Chapter V
DEGREE DATA

INTRODUCTION

A traditional measure of educational achievement is a degree. Patterns of degree earning derive from many influences: resources (Chap. I), individual desires and ability (Chaps. III and IV) and economic and social conditions, to list a few. In this chapter data are presented showing patterns in science degree earning at all levels.

The degrees data contained in this chapter are grouped into three categories: total number of earned degrees by subject and level, percent distribution of earned degrees by subject and level, and degree and distribution data for women and minorities.

HIGHLIGHTS

Earned Degrees

1. Between 1970 and 1979, the total number of associate degrees in science/engineering related occupational curricula increased by 183.7%. (Chart V-1)
2. The total number of degrees awarded in most science disciplines peaked in the early 1970's and has now declined; however, Bachelor's degrees in engineering continue to climb. (Charts V-3 to 10)
3. In 1979-80, Women obatined more degrees in mathematics education at the bachelor's and master's level than men. (Chart V-11)
4. From 1975 to 1980 earned bachelor's degrees in mathematics, statistics, and secondary teaching decreased by 42%. Computer science degrees increased by 145%. In universities 83% of computer science degrees are from computer science departments; in public colleges the fraction is 56%. However, many public colleges have joint mathematics and computer science departments. (Table V-14C).

Distribution:

1. As a percent of total associate degrees, science/engineering related occupational curricula grew from 25% to 37.5% between 1970 and 1979. (Chart V-2)
2. The number of science degrees as a percent of all degrees declined at all degree levels between 1968-69 and 1978-79. (Charts V-12 to 14)

Women and Minorities:

1. With a few exceptions, the number of science degrees at all levels earned by females has steadily increased. (Charts V-15 to 17)
2. Women have increased their share of science degrees in almost every discipline and at every level. (Charts V-18 to 20)
3. Minorities earn a greater percent of bachelor's degrees in the social sciences than in the natural sciences. (Chart V-21)

Chart V-1: Earned associate degrees, science/engineering-related occupational curricula, 1970-71 to 1978-79.

The total number of degrees in science/engineering-related occupational curricula has increased by 183.7% since 1970.

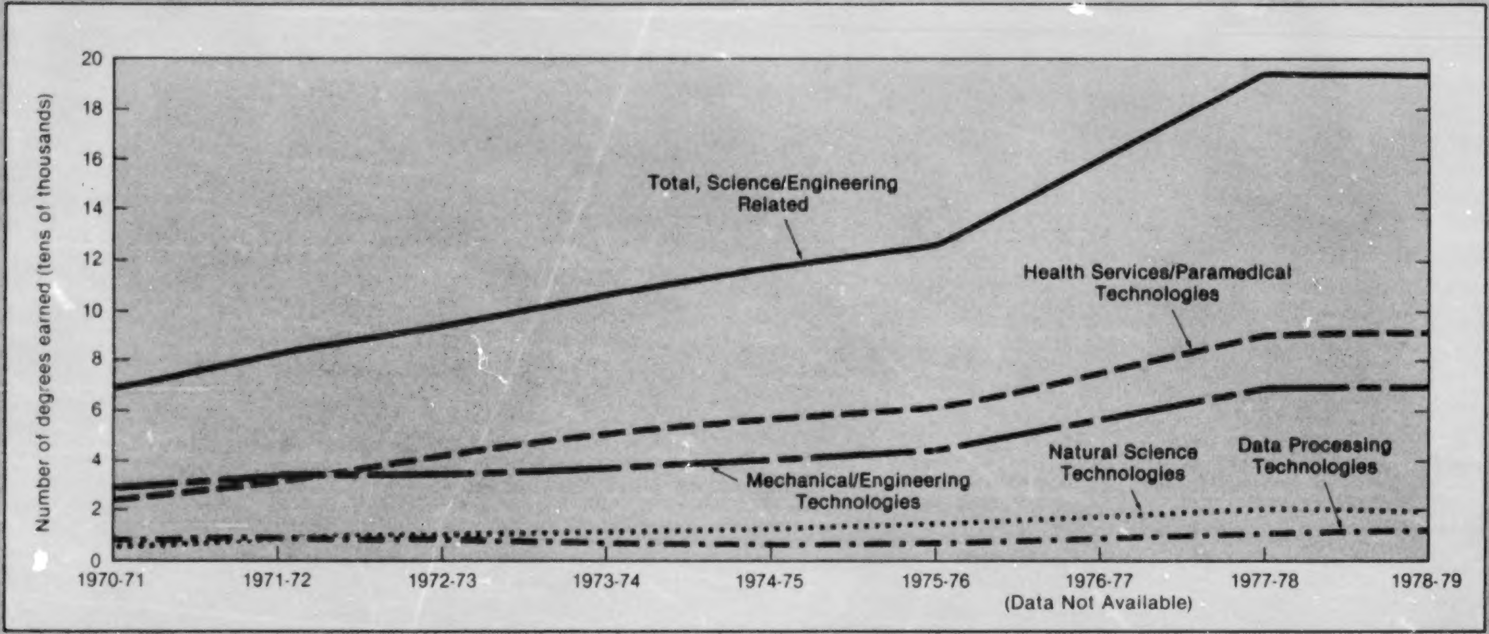


Table V-1: Earned associate[1] degrees in science/engineering-related occupational curricula, 1970-71 to 1978-79

Curriculum Category and Division	1970-71*	1971-72	1972-73*	1973-74	1974-75	1975-76	1977-78	1978-79	Percent Change 1970-71 1978-79
All Curricula Total	272,862	313,757	337,757	369,943	388,122	422,586	524,057	515,371	88.9
Occupational Curricula Science/Engineering-Related	68,213	83,069	94,623	107,332	118,505	127,579	194,270	193,507	183.7
Data Processing Technologies	7,564	7,841	7,640	6,998	6,821	7,176	10,830	12,454	64.6
Health Services/Paramedical Technologies	24,370	32,288	42,910	51,207	57,943	61,918	90,575	90,022	269.4
Mechanical/Engineering Technologies	30,172	34,546	34,781	37,631	40,775	45,169	71,617	71,288	136.3
Natural Science Technologies	6,107	8,394	9,292	11,496	12,966	13,316	21,248	19,743	223.3
All Other Curricula	204,649	230,690	243,134	262,611	269,617	295,007	329,787	321,864	60.3

*Does not include those below the technical or semiprofessional level.

[1] An associate degree is usually one granted for the first two years of formal academic study.

Sources: Malitz, Gerald S., *Associate Degrees and Other Formal Awards Below the Baccalaureate: Analysis of 6-7 year Trends*, p. 8. Pepin, Andrew J. and Wells, Agnes Q., *Associate Degrees and Other Formal Awards Below the Baccalaureate*, p. 6.

Chart V-2: Percent distribution of associate degrees, by curriculum category, 1972-73 to 1978-79

The percent of total degrees in science/engineering-related occupational curricula grew from 28.10% to 37.5%.

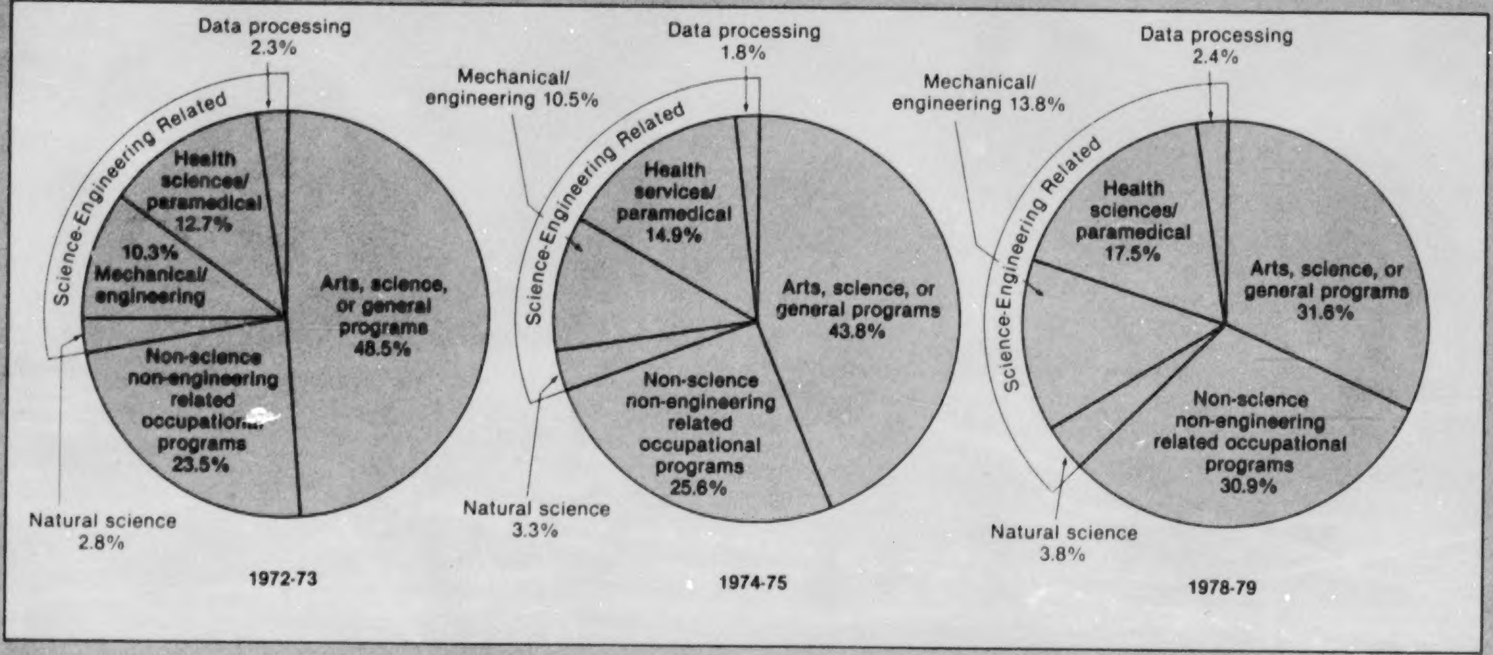
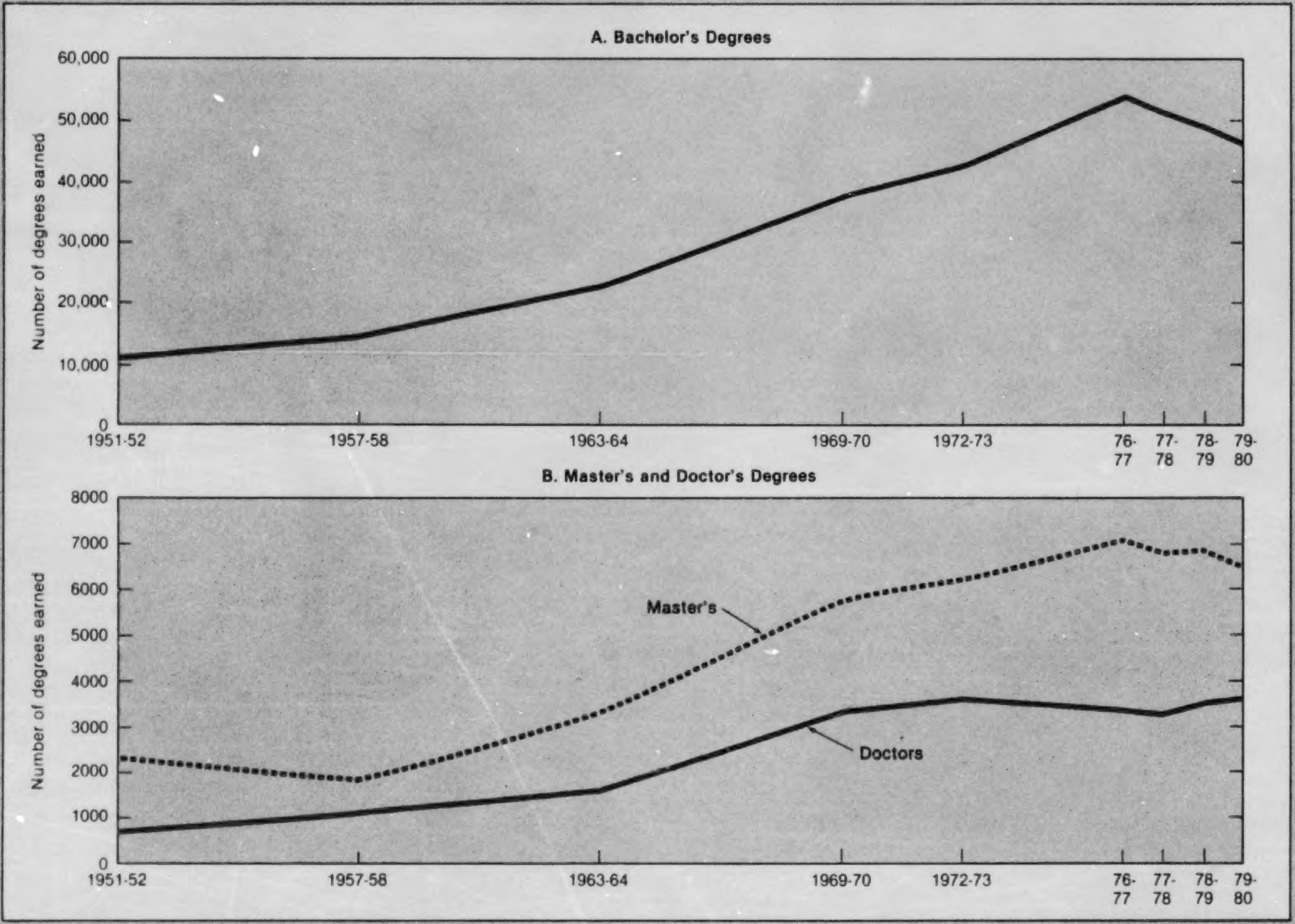


Table V-2: Percent distribution of associate degrees by curriculum category, 1970-71 — 1975-76

Curriculum Category and Division	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1977-78	1978-79
All Curricula, Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Arts and Science or General Programs	54.5	51.3	48.5	45.5	43.8	42.5	32.9	31.6
Occupational Curricula	45.5	48.7	51.5	54.5	56.2	57.5	—	—
Science/Engineering-Related	25.0	26.5	28.0	29.0	30.5	30.2	37.1	37.5
Data Processing Technologies	2.8	2.5	2.3	1.9	1.8	1.7	2.1	2.4
Health Services/Paramedical Technologies	8.9	10.3	12.7	13.8	14.9	14.6	17.3	17.5
Mechanical/Engineering Technologies	11.1	11.0	10.3	10.2	10.5	10.7	13.7	13.8
Natural Science Technologies	2.2	2.7	2.8	3.1	3.3	3.2	4.1	3.8
Nonscience/Nonengineering-Related	20.5	22.2	23.5	25.5	25.6	27.3	30.1	30.9
Business and Commerce Technologies	16.0	16.3	16.4	17.7	17.5	18.7	22.1	23.5
Public Service-Related Technologies	4.5	5.9	7.2	7.8	8.1	8.6	8.0	7.4

Sources: Malitz, Gerald S., *Associate Degrees and Other Formal Awards Below the Baccalaureate: Analysis of 6-year Trends*, p. 8. Pepin, Andrew J. and Wells, Agnes Q., *Associate Degrees and Other Formal Awards Below the Baccalaureate, 1978-79*, p. 6.

Charts V-3, A&B: Earned degrees in the biological sciences, by level or degree, 1951-52 to 1979-80



Grant, W. Vance & Eiden, Leo J., *Digest of Education Statistics*, 1980, National Center for Education Statistics, May, 1980, p. 120.

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Table V-3: Earned degrees in the biological sciences[1] conferred by institutions of higher education, by level of degree and by sex of student: 1951-52 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1951-52	11,094	8,212	2,882	2,307	1,908	399	764	680	84
1953-54	9,279	6,710	2,569	1,610	1,287	323	1,077	977	100
1955-56	12,423	9,515	2,908	1,759	1,379	380	1,025	908	117
1957-58	14,308	11,159	3,149	1,852	1,448	404	1,125	987	138
1959-60	15,576	11,654	3,922	2,154	1,668	486	1,205	1,086	119
1961-62	16,915	12,136	4,779	2,642	1,982	660	1,338	1,179	159
1963-64	22,723	16,321	6,402	3,296	2,348	948	1,625	1,432	193
1965-66	26,916	19,368	7,548	4,232	3,085	1,147	2,097	1,792	305
1967-68	31,826	22,968	8,840	5,506	3,959	1,547	2,784	2,345	439
1969-70	37,389	27,004	10,385	5,800	3,975	1,825	3,289	2,820	469
1970-71	35,743	25,333	10,410	5,728	3,805	1,923	3,645	3,050	595
1971-72	37,293	26,323	10,970	6,101	4,087	2,014	3,653	3,031	622
1972-73	42,233	29,636	12,597	6,263	4,354	1,909	3,636	2,926	710
1973-74	48,340	33,245	15,095	6,552	4,555	1,997	3,439	2,740	699
1974-75	51,741	34,612	17,129	6,550	4,587	1,963	3,384	2,641	743
1975-76	54,275	35,420	18,755	6,582	4,497	2,085	3,392	2,663	729
1976-77	53,605	34,218	19,387	7,114	4,718	2,396	3,397	2,671	726
1977-78	51,502	31,705	19,797	6,806	4,400	2,406	3,309	2,511	798
1978-79	48,846	29,191	19,655	6,831	4,265	2,566	3,542	2,636	906
1979-80	46,370	26,828	19,542	6,510	4,098	2,412	3,636	2,690	946

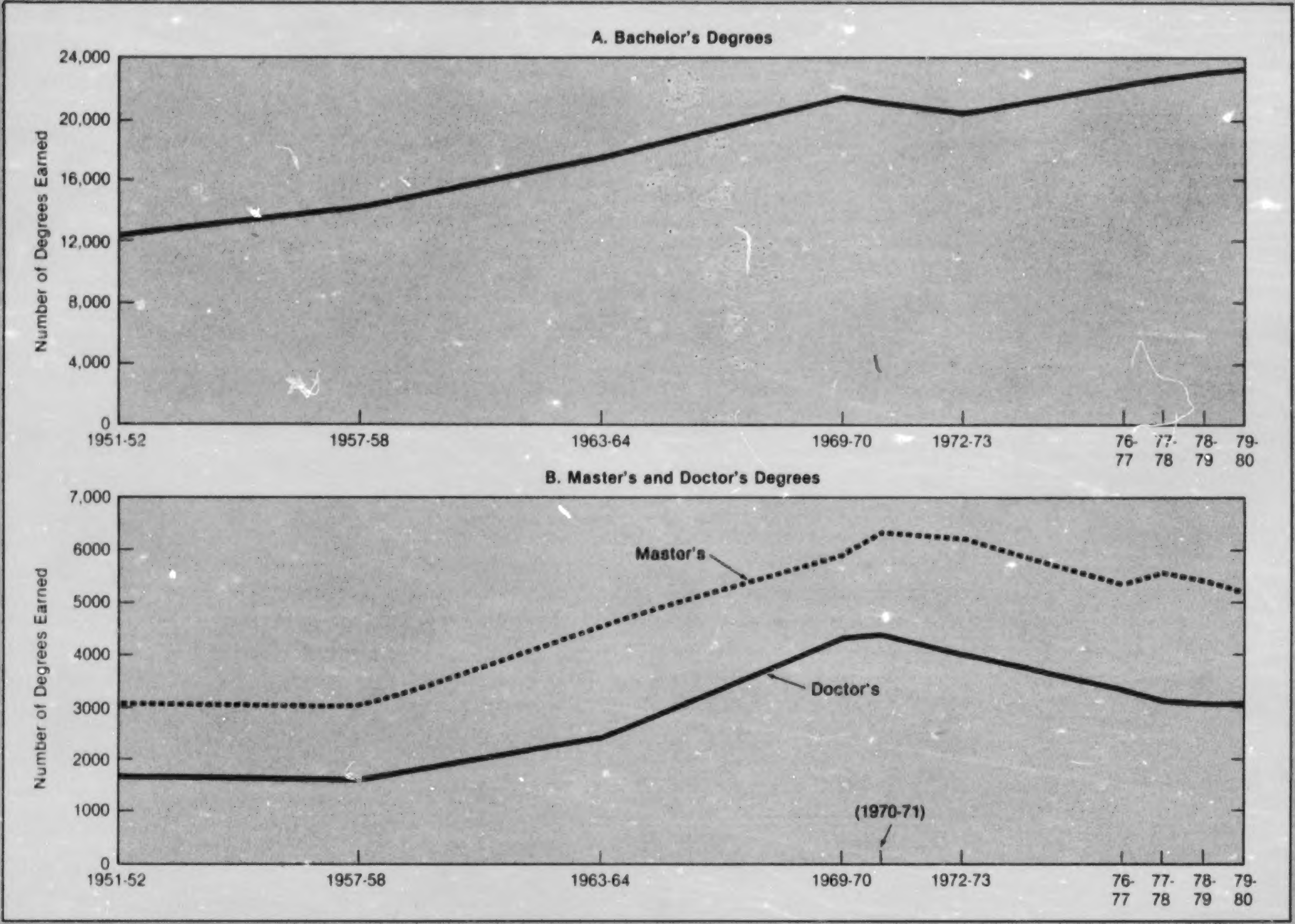
[1] Includes degrees in anatomy, bacteriology, biochemistry, biology, botany, entomology, physiology, zoology, and other biological sciences.

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics*, 1979, p. 122; 1980, p. 120.

Charts V-4, A&B: Earned degrees in the physical sciences, by level of degree, 1951-52 to 1979-80

The number of bachelor's degrees in the physical sciences declined somewhat in the early 1970's and rose to its highest point by 1979-80. The numbers of both master's and doctor's degrees have decreased since 1970-71.



Source: Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics*, 1980, p. 123

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Table V-4: Earned degrees in the physical sciences[1] conferred by institutions of higher education, by level of degree and by sex of student: United States, 1951-52 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1951-52	12,118	10,799	1,319	3,054	2,830	244	1,720	1,663	57
1953-54	9,838	8,584	1,254	2,374	2,197	177	1,686	1,625	61
1955-56	11,629	10,140	1,484	2,655	2,435	220	1,667	1,599	68
1957-58	14,317	12,659	1,658	3,030	2,759	271	1,655	1,589	66
1959-60	16,007	14,013	1,994	3,376	3,049	327	1,828	1,776	62
1961-62	15,851	13,728	2,123	3,928	3,544	384	2,122	2,035	87
1963-64	17,456	15,044	2,412	4,561	4,155	406	2,455	2,342	113
1965-66	17,129	14,822	2,307	4,987	4,462	525	3,045	2,914	131
1967-68	19,380	16,739	2,641	5,499	4,869	630	3,593	3,405	188
1969-70	21,439	18,522	2,917	5,935	5,093	842	4,312	4,077	235
1970-71	21,412	18,459	2,953	6,367	5,521	846	4,390	9,144	246
1971-72	20,745	17,663	3,081	6,287	5,404	883	4,103	3,830	273
1972-73	20,606	17,626	3,070	6,257	5,414	843	4,006	3,738	268
1973-74	21,178	17,674	3,504	6,062	5,186	876	3,626	3,373	253
1974-75	20,778	16,992	3,786	5,807	4,969	838	3,626	3,325	301
1975-76	21,465	17,353	4,112	5,466	4,648	818	3,431	3,132	299
1976-77	22,497	17,996	4,501	5,331	4,450	881	3,341	3,022	319
1977-78	22,986	18,090	4,896	5,561	4,620	941	3,133	2,821	312
1978-79	23,207	17,985	5,222	5,451	4,461	990	3,102	2,752	350
1979-80	23,410	17,864	5,546	5,219	4,248	971	3,089	2,705	384

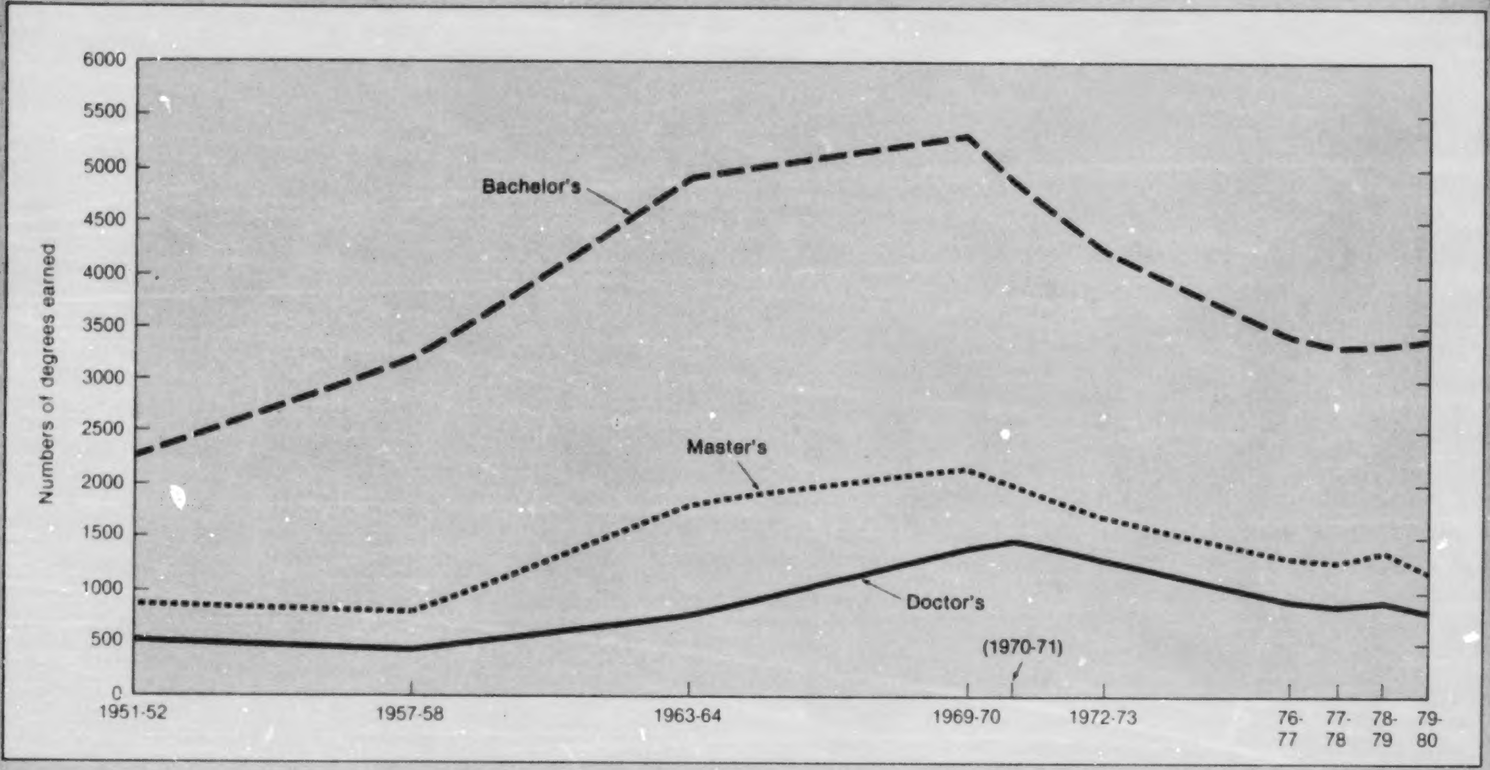
[1] Includes degrees in astronomy, chemistry, geology, metallurgy, meteorology, physics, and other physical sciences.

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occured over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, p. 121.
Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123. NCES unpublished data.

Chart V-5: Earned degrees in physics, by level of degree 1951-52 to 1979-80

The numbers of physics master's and bachelor's degrees were greatest in 1969-70; the number of doctor's degrees greatest in 1970-71.



Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Table V-5: Earned degrees in physics* conferred by institutions of higher education, by level of degree and by sex of student: United States, 1949-50 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1949-50	3,413	3,286	127	922	888	34	358	353	5
1951-52	2,245	2,139	106	886	851	35	485	476	9
1953-54	1,949	1,874	75	714	685	29	485	479	6
1955-56	2,329	2,228	101	742	719	23	470	462	8
1957-58	3,179	3,038	141	795	770	25	464	455	9
1959-60	4,322	4,154	168	1,073	1,039	35	487	477	10
1961-62	4,808	4,620	188	1,425	1,363	62	667	655	12
1963-64	4,946	4,714	232	1,848	1,782	66	778	767	11
1965-66	4,601	4,378	223	1,949	1,869	80	973	952	21
1967-68	5,038	4,745	293	2,088	1,993	45	1,260	1,234	26
1969-70	5,320	4,993	327	2,200	2,043	157	1,439	1,402	37
1970-71	5,071	4,729	342	2,188	2,038	150	1,482	1,439	43
1971-72	4,634	4,314	320	2,033	1,874	159	1,344	1,301	43
1972-73	4,259	3,949	310	1,747	1,634	113	1,338	1,287	51
1973-74	3,952	3,618	334	1,655	1,520	135	1,115	1,068	49
1974-75	3,706	3,347	359	1,574	1,450	124	1,080	1,028	52
1975-76	3,544	3,156	388	1,451	1,319	132	997	952	45
1976-77	3,420	3,062	358	1,319	1,193	126	945	890	55
1977-78	3,330	2,961	369	1,294	1,171	123	873	824	49
1978-79	3,337	2,938	399	1,319	1,184	135	918	852	66
1979-80	3,396	2,962	434	1,192	1,074	118	830	767	63

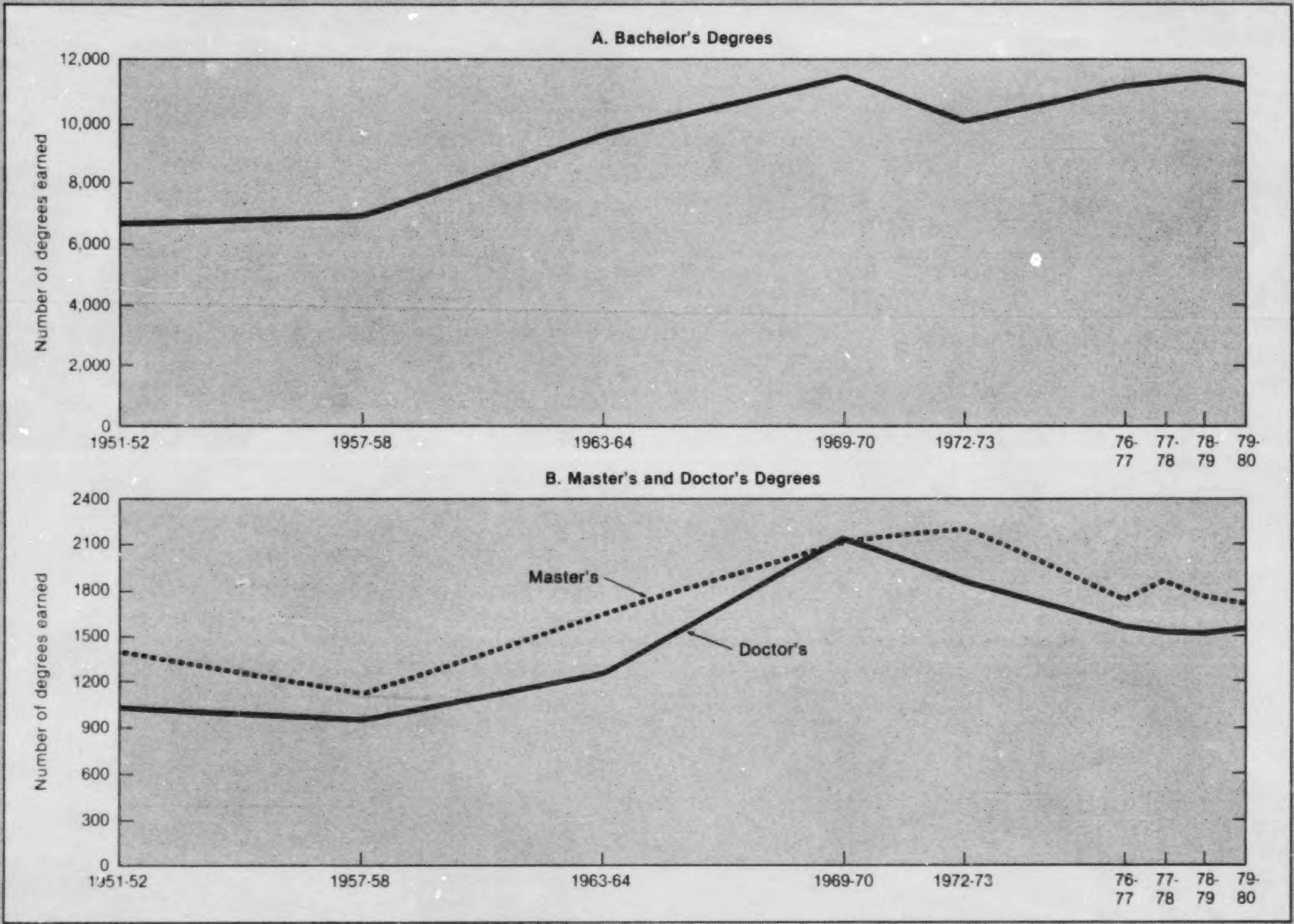
NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

*Physics includes: General, Molecular and Nuclear.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, p. 121.
Grant, W. and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Charts V-6, A&B: Earned degrees in chemistry by level of degree, 1951-52 to 1979-80

The number of bachelor's degrees in chemistry remains near the peak reached in 1969-70, while the numbers of master's and doctor's degrees are declining since the early 1970's.



Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Table V-8: Earned degrees in chemistry* conferred by institutions of higher education, by level of degree and by sex of student: United States, 1949-50 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1949-50	10,597	4,121	1,476	1,576	1,368	208	953	914	39
1951-52	6,794	5,705	1,089	1,409	1,242	167	1,031	986	45
1953-54	5,752	4,707	1,045	1,098	972	126	1,013	968	45
1955-56	6,141	4,970	1,171	1,164	1,035	129	986	934	52
1957-58	6,982	5,685	1,297	1,125	958	167	939	890	49
1959-60	7,569	5,989	1,580	1,228	1,025	203	1,048	1,000	48
1961-62	8,047	6,355	1,692	1,401	1,162	239	1,114	1,045	69
1963-64	9,660	7,774	1,886	1,560	1,285	275	1,271	1,179	92
1965-66	9,687	7,911	1,776	1,817	1,470	347	1,533	1,442	91
1967-68	10,783	8,851	1,932	1,977	1,575	402	1,723	1,584	139
1969-70	11,519	9,453	2,066	2,111	1,638	473	2,166	2,000	166
1970-71	11,063	9,026	2,037	2,275	1,787	488	2,159	1,986	173
1971-72	10,590	8,533	2,057	2,248	1,748	500	1,971	1,778	193
1972-73	10,128	8,208	1,920	2,225	1,761	464	1,872	1,694	178
1973-74	10,438	8,353	2,085	2,125	1,661	464	1,823	1,650	173
1974-75	10,549	8,210	2,339	1,986	1,580	406	1,822	1,618	204
1975-76	11,022	8,550	2,472	1,783	1,406	377	1,621	1,425	196
1976-77	11,215	8,659	2,556	1,767	1,324	443	1,568	1,381	187
1977-78	11,315	8,518	2,797	1,886	1,445	441	1,521	1,318	203
1978-79	11,509	8,458	3,051	1,757	1,312	445	1,516	1,286	230
1979-80	11,232	8,050	3,182	1,723	1,279	444	1,545	1,287	258

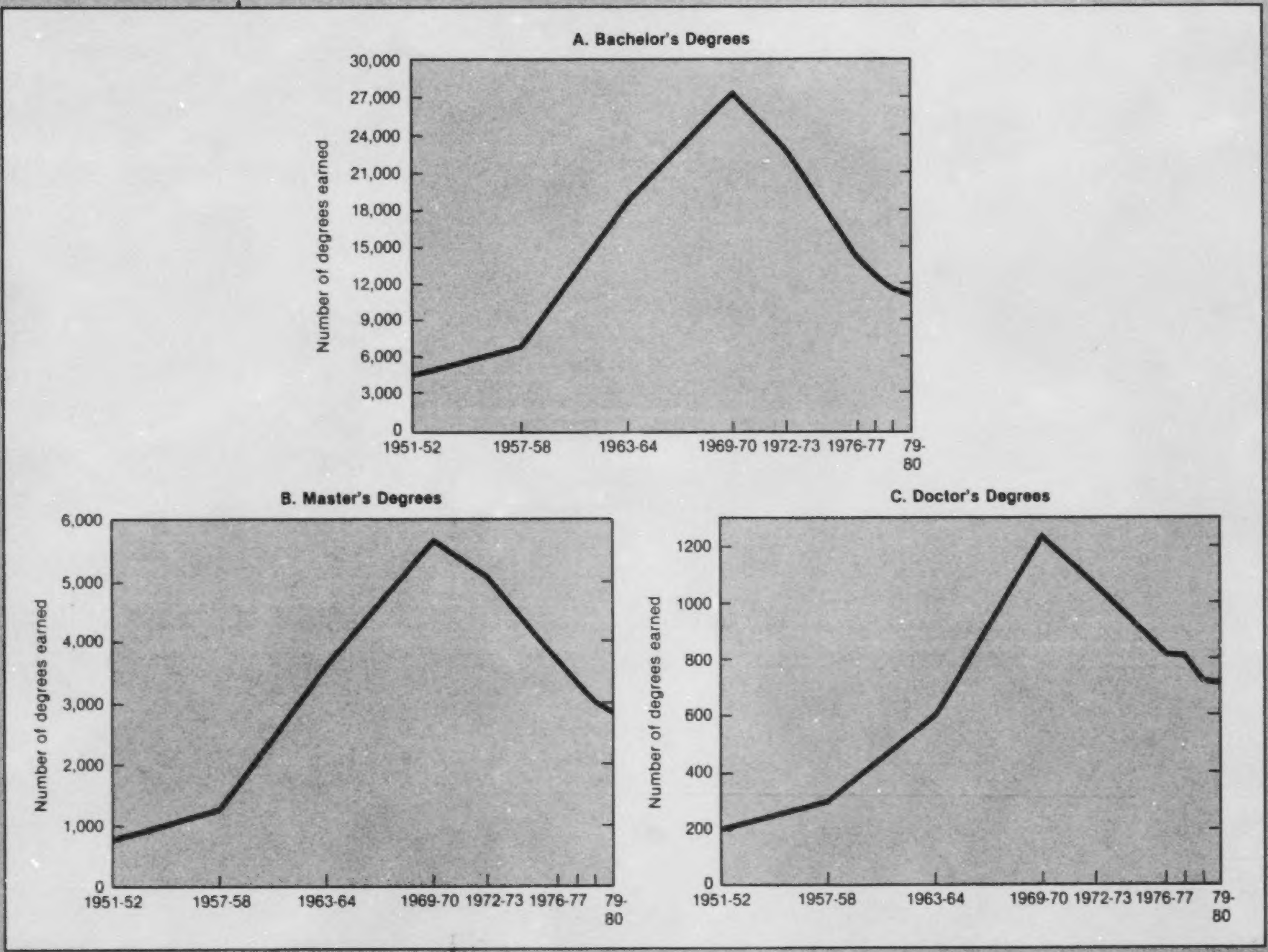
NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

*Chemistry includes: General, Inorganic, Organic, Physical, Analytical and Pharmaceutical.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, p. 120.
Grant, W. and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Chart V-7, A, B&C: Earned degrees in mathematics, by level of degree, 1951-52 to 1979-80

In 1969-70 at every level more mathematics degrees were earned than in any other year. Since then there has been a steady decline in bachelor's and master's degrees and a leveling off in doctorates since 1976-77.



Grant, W. Vance and Eidson, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Table V-7: Earned degrees in mathematics[1] conferred by institutions of higher education, by level of degree and by sex of student: United States, 1949-50 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1949-50	6,382	4,942	1,440	974	784	190	160	151	9
1951-52	4,696	3,374	1,322	802	663	139	206	195	11
1953-54	4,078	2,717	1,361	706	579	127	227	213	14
1955-56	4,646	3,128	1,518	898	719	179	235	225	10
1957-58	6,905	4,943	1,962	1,234	994	240	247	232	15
1959-60	11,399	8,293	3,106	1,757	1,422	335	303	285	18
1961-62	14,570	10,331	4,239	2,680	2,179	501	396	372	24
1963-64	18,624	12,656	5,968	3,597	2,911	686	596	567	29
1965-66	19,977	13,326	6,651	4,769	3,769	1,000	782	725	57
1967-68	23,513	14,782	8,731	5,527	4,199	1,328	947	895	52
1969-70	27,442	17,177	10,265	5,636	3,966	1,670	1,236	1,140	96
1970-71	24,801	15,369	9,432	5,191	3,673	1,518	1,199	1,106	93
1971-72	23,713	14,454	9,259	5,198	3,655	1,543	1,128	1,039	89
1972-73	23,067	13,796	9,271	5,028	3,525	1,503	1,068	966	102
1973-74	21,635	12,791	8,844	4,834	3,337	1,497	1,031	931	100
1974-75	18,181	10,586	7,595	4,327	2,905	1,422	975	865	110
1975-76	15,984	9,475	6,509	3,857	2,547	1,310	856	762	94
1976-77	14,196	8,303	5,893	3,695	2,396	1,299	823	714	109
1977-78	12,569	7,398	5,171	3,373	2,228	1,145	805	681	124
1978-79	11,806	6,899	4,907	3,036	1,985	1,051	730	608	122
1979-80	11,378	6,562	4,816	2,860	1,828	1,032	724	624	100

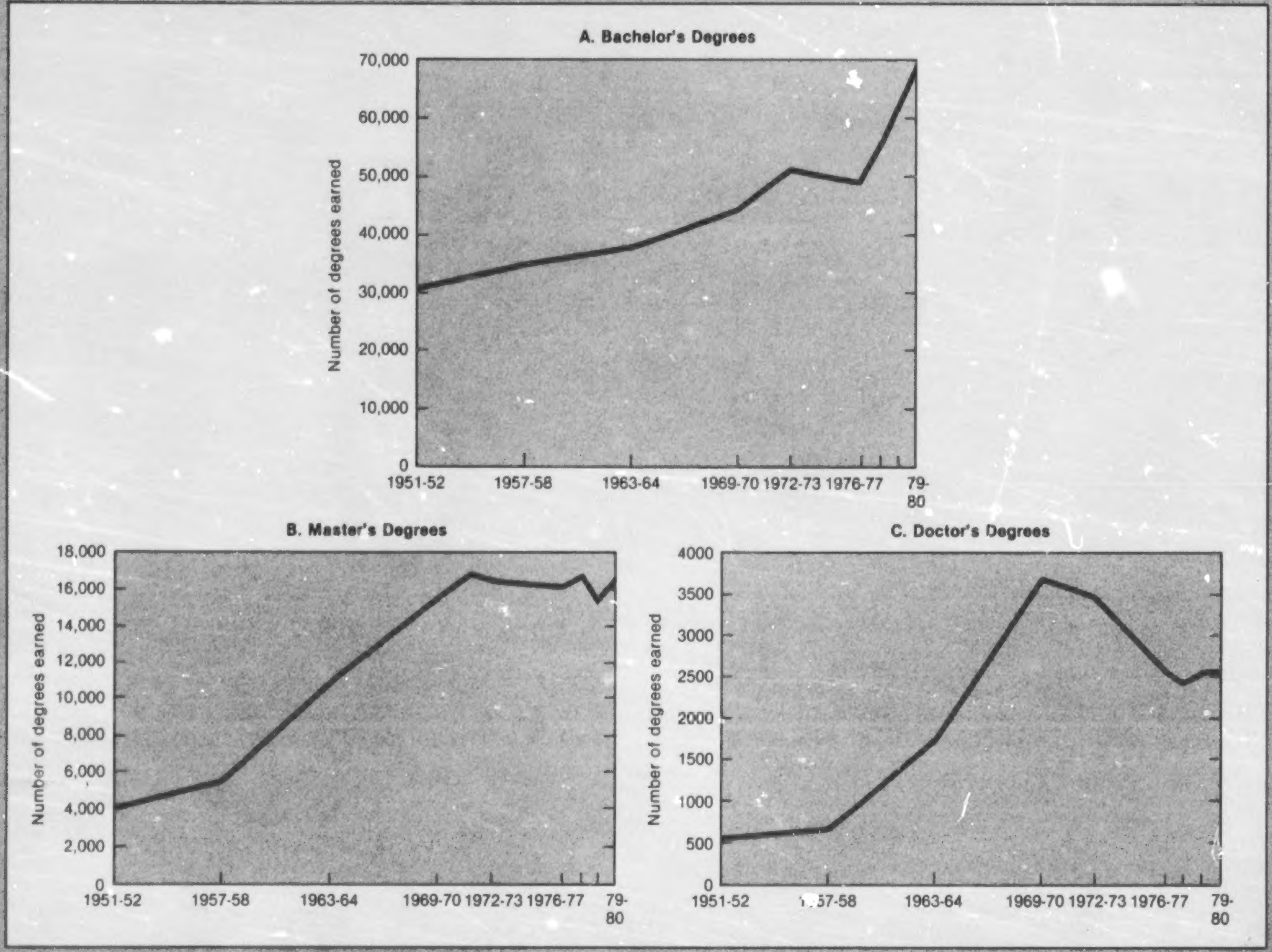
[1] Includes degrees conferred in statistics.

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, p. 120.
Grant, W. and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Chart V-8, A, B&C: Earned degrees in engineering by level of degree, 1951-52 to 1979-80

In 1978-1979 the number of engineering bachelor's degrees awarded surpassed the peak reached in 1972-73 and continued to gain in 1979-1980. The number of master's degrees was highest in 1971-72 but the subsequent decline appears to have stabilized. The number of doctor's degrees has fallen steadily since 1969-70 and also appears to have stabilized.



Source: Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics*, 1980, p. 122.

Table V-8 A: Earned degrees in engineering conferred by institutions of higher education, by level of degree and by sex of student: United States, 1949-50 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1949-50	52,246	52,071	175	4,496	4,481	15	417	416	1
1951-52	30,492	30,412	60	4,091	4,073	18	529	526	3
1953-54	22,227	22,163	65	4,204	4,189	15	594	594	—
1955-56	26,219	26,143	76	4,724	4,705	19	610	610	—
1957-58	35,191	35,082	109	5,788	5,768	20	647	643	4
1959-60	37,679	37,537	142	7,159	7,133	26	786	783	3
1961-62	34,551	34,430	121	8,909	8,869	40	1,207	1,203	4
1963-64	38,013	34,862	151	10,827	10,793	34	1,693	1,686	7
1965-66	35,615	35,472	143	13,675	13,599	76	2,304	2,295	9
1967-68	37,368	37,159	209	15,182	15,083	99	2,932	2,920	12
1969-70	44,479	44,149	330	15,593	15,421	172	3,681	3,657	24
1970-71	50,046	49,646	400	16,443	16,358	185	3,638	3,615	23
1971-72	51,164	50,638	526	16,960	16,688	272	3,671	3,649	22
1972-73	51,265	50,652	613	16,619	16,341	278	3,492	3,438	54
1973-74	50,286	49,490	796	15,379	15,023	356	3,312	3,257	55
1974-75	46,852	45,838	1,014	15,348	14,973	375	3,108	3,042	66
1975-76	46,331	44,871	1,460	16,342	15,760	582	2,821	2,755	66
1976-77	49,283	47,065	2,218	16,245	15,525	720	2,586	2,513	73
1977-78	55,654	51,945	3,709	16,398	15,533	865	2,440	2,383	57
1978-79	62,375	57,201	5,174	15,495	14,544	951	2,506	2,423	83
1979-80	68,893	62,488	6,405	16,243	15,101	1,142	2,507	2,412	95

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, p. 122.
Grant, W. and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 122. NCES unpublished data..

Table V-8 B: Number and percent of engineering degrees granted by level of degree and minority group, 1978-79 – 1980-81

	Total		Black		Spanish Surnamed‡		Asian/ Pacific		American Indian		Foreign Nationals	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
1968-69*												
Bachelor's	39,972	100.0	314	0.79							1,300	3.25
Master's	14,980	100.0	17	0.11			†				1,784	11.91
Ph.D	3,387	100.0	2	0.06							410	12.11
1969-70*												
Bachelor's	42,966	100.0	378	0.88								
Master's	15,548	100.0	50	0.32			†					
Ph.D	3,620	100.0	1	0.03								
1970-71*												
Bachelor's	43,167	100.0	407	0.94							1,565	3.62
Master's	16,383	100.0	47	0.29			†				2,952	18.02
Ph.D	3,640	100.0	8	0.22							741	20.36
1971-72*												
Bachelor's	44,190	100.0	579	1.31							1,944	4.40
Masters**	17,356	100.0	78	0.45							2,973	17.13
Ph.D	3,774	100.0	13	0.34							773	20.48
1972-73												
Bachelor's	43,429	100.0	657	1.51	866	1.99	684	1.58	46	0.11	2,136	4.92
Master's**	17,152	100.0	104	0.61	139	0.81	261	1.52	15	0.09	2,551	14.87
Ph.D	3,587	100.0	13	0.36	12	0.34	55	1.53	1	0.03	708	19.74
1973-74												
Bachelor's	41,407	100.0	756	1.83	1,037	2.50	957	2.31	32	0.08	2,436	5.88
Master's**	15,885	100.0	158	0.99	192	1.21	425	2.08	4	0.03	3,099	19.51
Ph.D	3,362	100.0	12	0.36	20	0.60	106	3.15	0	—	1,014	30.16
1974-75												
Bachelor's	38,210	100.0	734	1.92	1,060	2.77	883	2.31	44	0.12	2,466	6.45
Master's**	15,773	100.0	141	0.89	185	1.12	482	3.06	3	0.02	3,250	20.61
Ph.D	3,039	100.0	17	0.55	28	0.92	141	4.64	2	0.07	891	29.32
1975-76												
Bachelor's	37,970	100.0	777	2.05	1,019	2.68	1,073	2.83	41	0.11	2,799	7.37
Master's**	16,506	100.0	154	0.93	191	1.16	782	4.74	14	0.09	3,691	22.36
Ph.D	2,977	100.0	10	0.33	15	0.50	168	5.64	0	—	1,060	35.61
1976-77												
Bachelor's	40,095	100.0	844	2.11	1,035	2.58	1,146	2.86	36	0.09	2,996	7.47
Master's**	16,551	100.0	147	0.89	217	1.31	708	4.28	7	0.04	3,825	23.11
Ph.D	2,814	100.0	16	0.57	22	0.78	158	5.62	1	0.04	995	35.36
1977-78												
Bachelor's	46,091	100.0	894	1.94	1,072	2.33	1,195	2.59	37	0.08	3,084	6.69
Master's**	16,182	100.0	202	1.25	243	1.50	797	4.93	4	0.03	3,720	22.99
Ph.D	2,573	100.0	15	0.58	25	0.97	175	6.80	3	0.12	874	33.97
1978-79												
Bachelor's	52,598	100.0	1,076	2.05	1,212	2.30	1,532	2.91	59	0.11	3,788	7.20
Master's**	15,624	100.0	157	1.01	213	1.36	675	4.32	9	0.06	3,944	25.24
Ph.D	2,815	100.0	19	0.68	22	0.78	177	6.29	0	—	929	33.00
1979-80												
Bachelor's	58,742	100.0	1,320	2.25	1,332	2.27	1,922	3.27	60	0.10	4,895	8.33
Master's**	17,243	100.0	167	0.97	247	1.43	827	4.80	4	0.02	4,512	26.17
Ph.D	2,751	100.0	19	0.69	25	0.91	154	5.60	1	0.04	982	35.70
1980-81												
Bachelor's	62,935	100.0	1,445	2.3	1,518	2.4	2,267	3.6	40	0.06	5,622	8.9
Master's**	17,914	100.0	183	0.10	281	16	968	54	8	004	4,677	26.6
Ph.D	2,841	100.0	16	.56	20	.70	148	5.2	3	.1	1,054	37.1

*Totals for minority groups in these years include only numbers actually reported. The number would be higher if all institutions had reported all categories.

**Includes engineer degrees.

†Data were not broken by any minority group except blacks, prior to 1972-73; however, some foreign national data was available.

‡Includes University of Puerto Rico as follows:
1973-1980 Bachelors: 343, 397, 416, 339, 338, 324, 404, 329.
1973-1980 Masters: 13, 6, 2, 7, 6, 9, 15, 7.

Source: Scientific Manpower Commission, Betty Vetter.

Table V-8 C: Engineering degrees by curriculum and level, 1981

Electrical Engineering produces the most graduates at all three degree levels followed by mechanical, civil and chemical engineering. Although chemical engineering awarded only half the number of bachelor's degrees as did mechanical, the number of Ph.Ds was approximately the same.

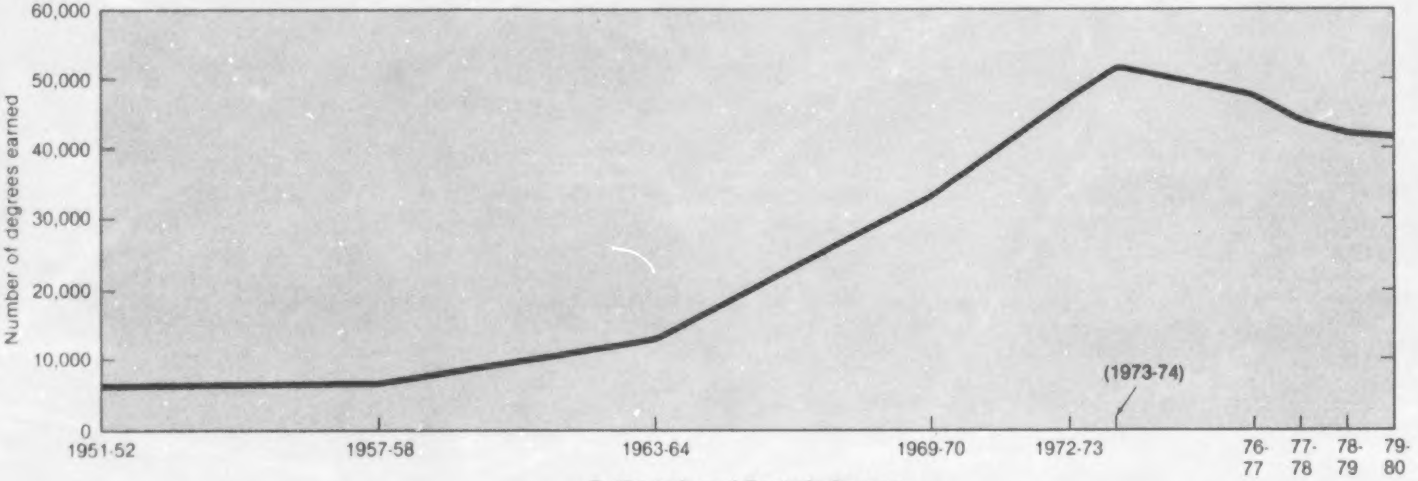
	Bachelor	Master	Engineer	Doctor
Aerospace	1,587	380	10	114
Agricultural	666	157	0	52
Architectural	474	53	0	1
Bioengineering	496	184	0	54
Ceramic	291	54	0	18
Chemical	6,863	1,312	14	312
Computer	2,356	1,294	7	171
Civil	10,547	3,002	40	357
Electrical	14,558	3,762	83	503
Engineering Sciences	1,067	487	2	187
Environmental	248	473	14	49
General	2,169	701	26	123
Industrial & Manufacturing	3,225	1,597	11	109
Marine & Naval	854	152	22	22
Mechanical	13,462	2,471	24	339
Mining	1,054	151	0	45
Materials	1,081	447	6	206
Nuclear	444	304	7	112
Petroleum	1,031	161	0	13
Other	227	69	0	6
Systems	235	432	5	48
Total	62,935	17,643	271	2,841

Source: Engineering Manpower Commission of the American Association of Engineering Societies, Inc.

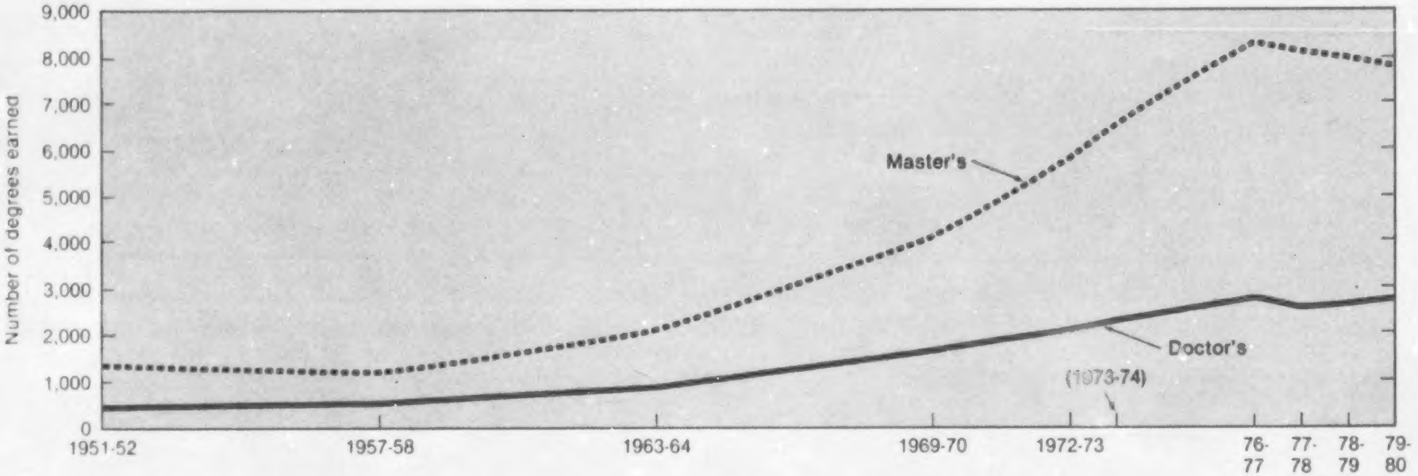
Chart V-9, A&B: Earned degrees in psychology, by level of degree, 1951-52 to 1979-80

Since 1973-74 there has been a decline in the numbers of bachelor's degrees granted in psychology; the numbers of master's and doctor's have leveled off.

A. Bachelor's Degrees



B. Master's and Doctor's Degrees



Source: Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 123.

Table V-9: Earned degrees in psychology conferred by institutions of higher education, by level of degree and by sex of student: United States, 1949-50 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1949-50	9,569	6,055	3,514	1,316	948	368	283	241	42
1951-52	6,591	3,775	2,816	1,406	1,068	340	540	467	73
1953-54	5,706	3,074	2,632	1,254	885	369	619	553	66
1955-56	5,601	3,082	2,519	973	690	283	634	548	86
1957-58	6,867	4,038	2,829	1,235	836	399	572	488	84
1959-60	8,061	4,773	3,288	1,406	981	425	641	544	97
1961-62	9,578	5,798	3,780	1,832	1,269	563	781	632	149
1963-64	13,258	7,817	5,441	2,059	1,371	688	939	757	182
1965-66	16,897	10,002	6,895	2,530	1,680	850	1,046	826	220
1967-68	23,819	13,792	10,027	3,479	2,321	1,158	1,268	982	286
1969-70	33,606	19,042	14,564	4,111	2,549	1,562	1,668	1,296	372
1970-71	37,880	21,029	16,851	4,431	2,783	1,648	1,782	1,355	427
1971-72	43,093	23,159	19,934	5,289	3,259	2,030	1,881	1,414	467
1972-73	47,695	24,976	22,719	5,831	3,495	2,336	2,089	1,484	605
1973-74	51,821	25,705	26,116	6,588	3,971	2,617	2,336	1,645	691
1974-75	50,988	24,190	26,798	7,066	4,044	3,022	2,442	1,688	754
1975-76	49,908	22,832	27,076	7,811	4,171	3,640	2,581	1,762	819
1976-77	47,794	20,692	27,102	8,320	4,316	4,004	2,761	1,770	991
1977-78	44,559	18,348	26,211	8,160	3,919	4,241	2,587	1,621	966
1978-79	42,461	16,464	25,997	8,003	3,672	4,331	2,662	1,597	1,065
1979-80	41,962	15,419	26,543	7,806	3,376	4,430	2,768	1,602	1,166

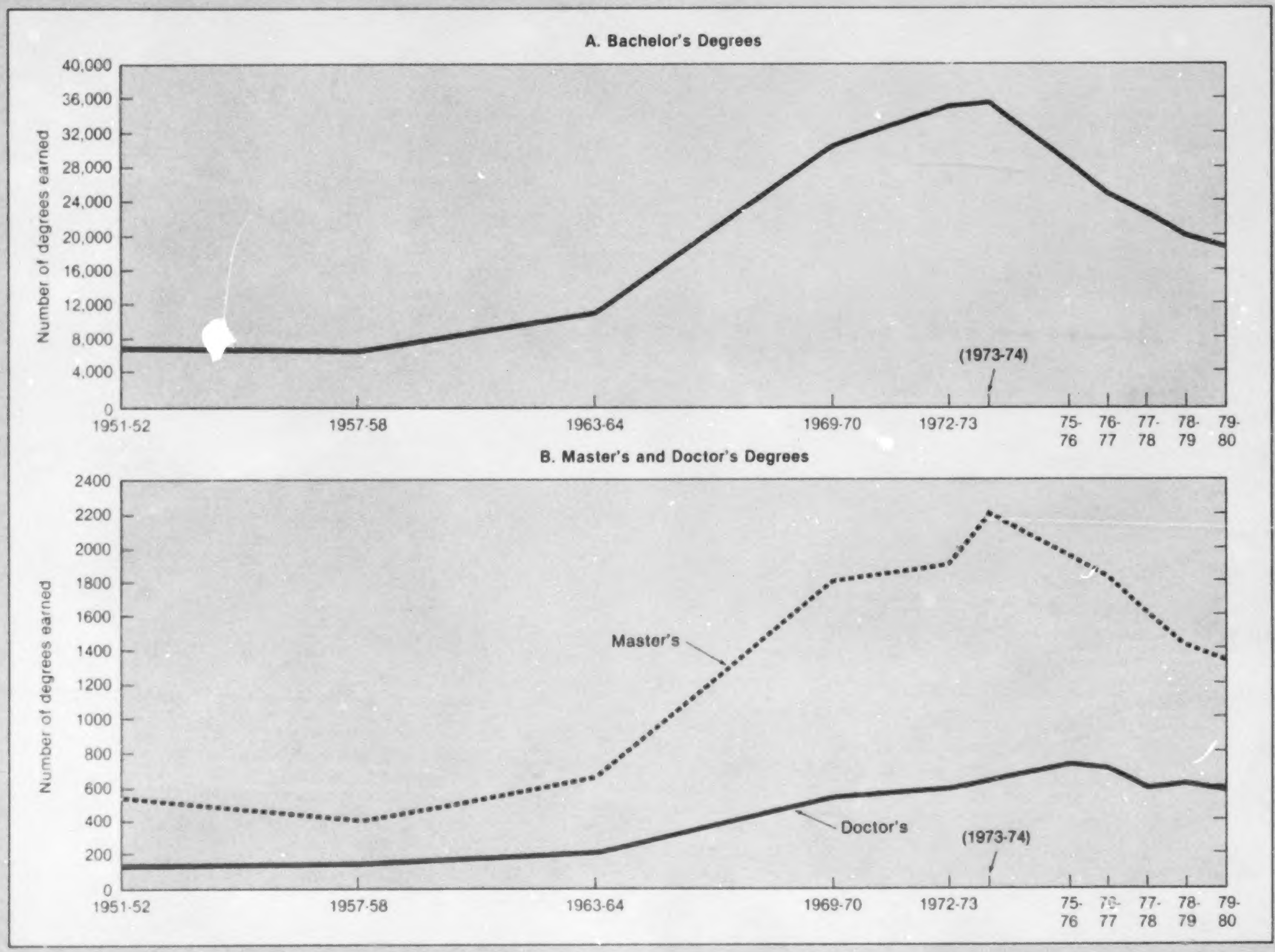
NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1977-78*, p. 119, and U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, reports on *Earned Degrees Conferred.*

Grant, W. and Eiden, Leo J., Digest of Education Statistics, 1980, p. 123. NCES unpublished data.

Chart V-10, A&B: Earned degrees in sociology, by level of degree, 1951-52 to 1979-80

The numbers of both bachelor's and master's degrees in sociology have declined since 1973-74. The number of doctor's degrees appears to be declining slightly.



A. Bachelor's Degrees

B. Master's and Doctor's Degrees

Source: Grant, W. Vance and Eiden, Leo J., *Digest of Education Statistics, 1980*, p. 124.

Table V-10: Earned degrees in sociology conferred by institutions of higher education, by level of degree and by sex of student: United States, 1949-50 to 1979-80

Year	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
1	2	3	4	5	6	7	8	9	10
1949-50	7,870	3,837	4,033	552	373	179	98	80	18
1951-52	6,648	2,967	3,681	517	386	131	141	121	20
1953-54	5,692	2,383	3,309	440	323	117	184	156	28
1955-56	5,878	2,535	3,343	402	275	127	170	141	29
1957-58	6,568	2,972	3,596	397	258	139	150	122	28
1959-60	7,147	3,162	3,985	440	327	113	161	135	26
1961-62	8,120	3,606	4,514	578	422	156	173	147	26
1963-64	10,943	4,437	6,506	646	466	180	198	169	29
1965-66	15,038	6,104	8,934	981	680	301	244	208	36
1967-68	21,710	8,469	13,241	1,193	790	403	367	299	68
1969-70	30,436	12,362	18,074	1,813	1,138	675	534	430	104
1970-71	33,263	13,610	19,653	1,808	1,131	677	574	455	119
1971-72	35,216	15,231	19,985	1,944	1,191	753	636	500	136
1972-73	35,436	15,580	19,856	1,923	1,146	777	583	429	154
1973-74	35,491	15,199	20,292	2,196	1,327	869	632	455	177
1974-75	31,488	13,209	18,279	2,112	1,304	808	693	484	209
1975-76	27,634	11,245	16,389	2,009	1,165	844	729	511	218
1976-77	24,989	9,802	15,187	1,830	1,018	812	714	480	234
1977-78	22,750	8,322	14,428	1,611	878	733	599	376	223
1978-79	20,285	7,037	13,248	1,415	745	670	612	391	221
1979-80	18,881	6,270	12,611	1,341	667	674	583	355	228

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1977-78*, p. 118 and U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, reports on *Earned Degrees Conferred*.

Grant, W. and Eiden, Lee J., Digest of Education Statistics, 1980, p. 124. NCES unpublished data.

Chart V-11: Earned degrees in mathematics and science education, by level of degree and by sex, 1979-80

Women obtain more degrees in mathematics education at the bachelor's and master's levels than men.

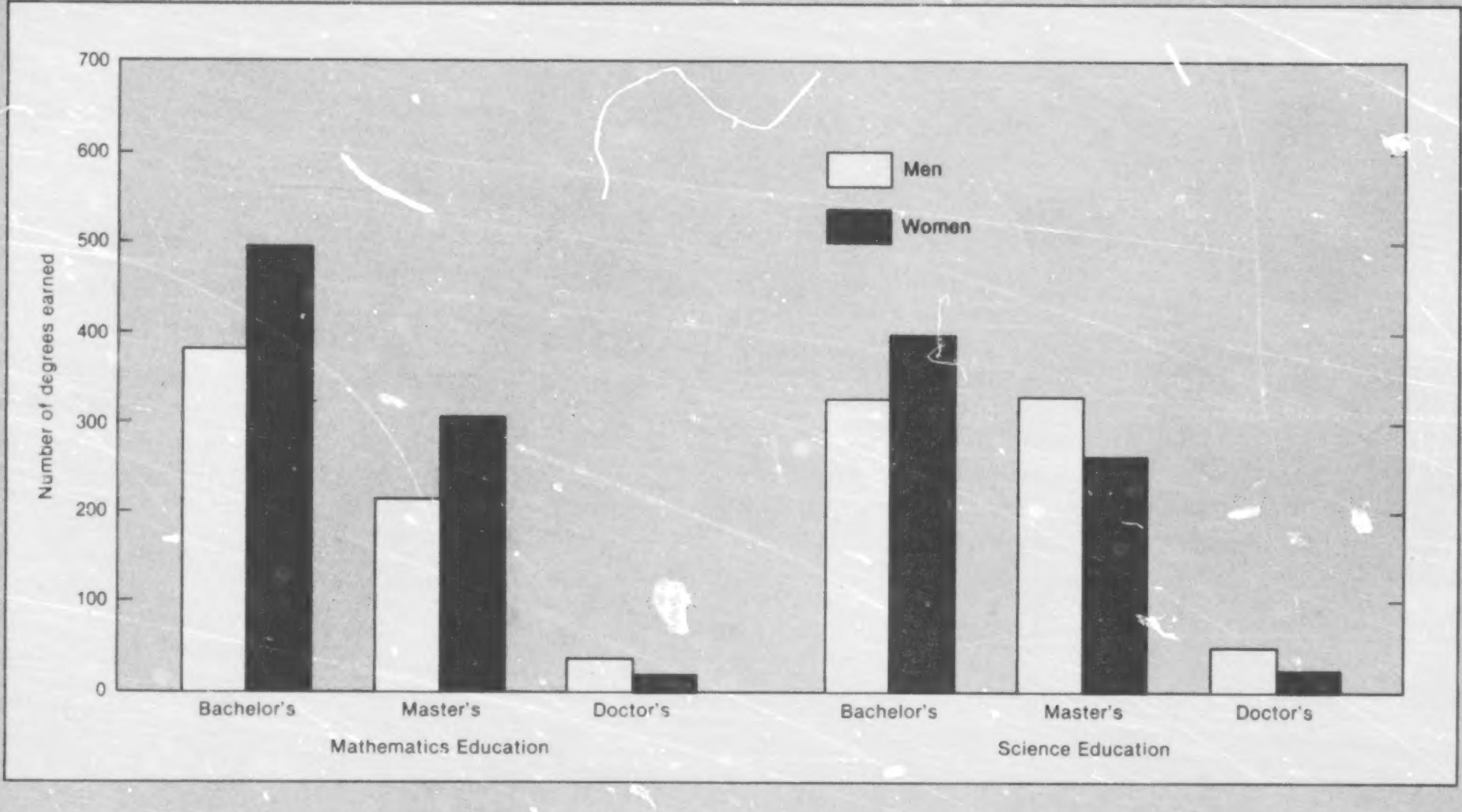


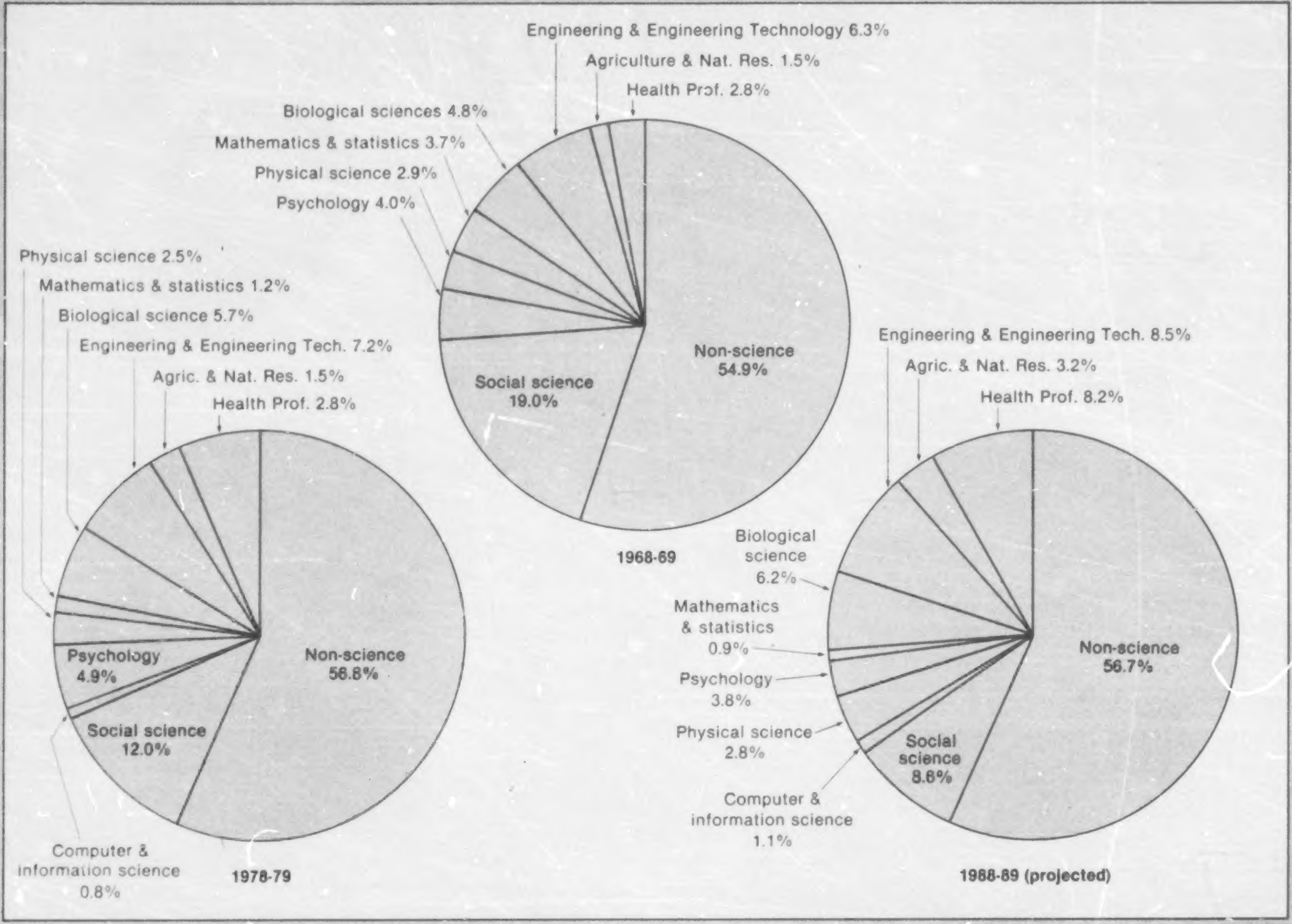
Table V-11: Earned degrees in mathematics and science education, by level of degree and sex, 1979-80

Type	Bachelor's degrees			Master's degrees			Doctor's degrees		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Mathematics education........................	832	338	494	517	212	305	38	23	15
Science Education	725	327	398	591	328	263	73	50	23

Source: U.S. Department of Health, Education and Welfare, National Center for Education Statistics, *Earned Degrees Conferred, 1979-80*,, p. 21.

Chart V-12: Percent distribution of earned bachelor's degrees by field, 1968-69 to 1988-89

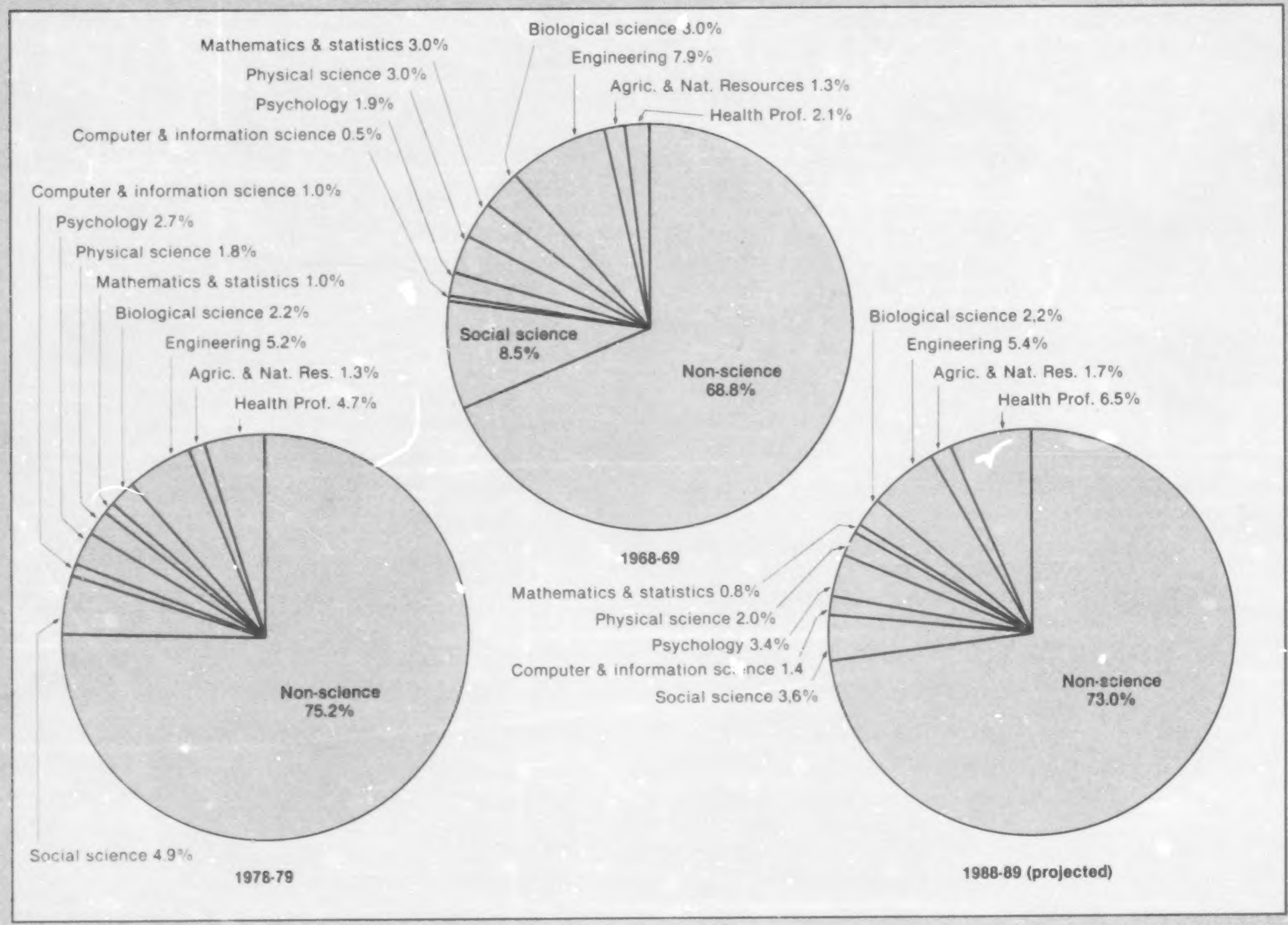
The most significant trend in the percent distribution of bachelor's degrees is the projected decrease in mathematics and statistics between 1968-69 and 1988-89 and the rise of computer and information science as a discipline.



Source: Frankel, Martin M., *Projections of Education Statistics to 1988-89*. P. 63.

Chart V-13: Percent distribution of earned master's degrees by field, 1968-69 to 1988-89

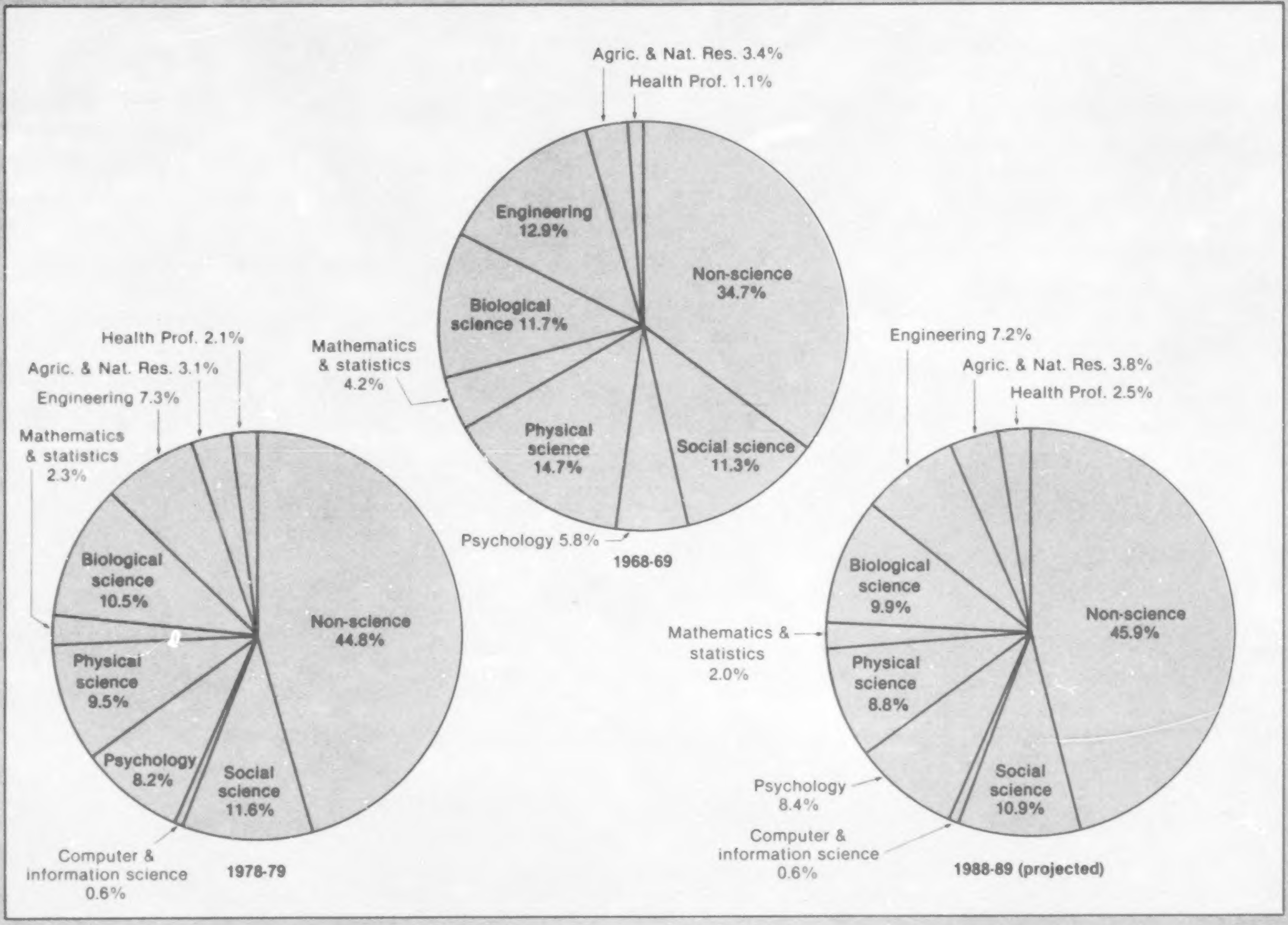
The most significant trend in the percent distribution of master's degrees in the sciences is their overall decline, between 1968-69 and 1978-79 and a slight projected increase by 1988-89.



Source: Frankel, Martin M., *Projections of Education Statistics to 1988-89*, p. 64.

Chart V-14: Percent distribution of earned doctors degrees by field, 1968-69 to 1988-89

The most significant trend in the percent distribution of doctor's degrees in the sciences is their overall decline, between 1968-69 and 1978-79 and a further projected decline by 1988-89. This decline is led by physical sciences, engineering, and mathematics and statistics.



Source: Frankel, Martin M., *Projections of Education Statistics to 1988-89*, p. 86.

Table V-12, 13, 14: Percent distribution of earned degrees, by field of study and level: 1968-69 to 1988-89

Year	A. Social sciences					B. Humanities				
	Total social sciences	Social science	Psychology	Public affairs and services	Library science	Total humanities	Architecture and environmental design	Fine and applied arts	Foreign language	Communications
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
					Bachelor's					
1966-69	23.6	19.0	4.0	0.5	0.1	8.4	0.5	4.3	2.9	0.7
1978-79	21.1	12.0	4.9	4.1	0.1	9.4	1.0	4.3	1.2	2.9
1988-89	17.5	8.6	3.8	5.1	(i)	10.2	1.0	4.2	1.0	4.0
					Master's					
1968-69	16.6	8.5	1.9	3.1	3.1	7.2	0.6	3.8	2.4	0.4
1978-79	15.8	4.9	2.7	6.2	2.0	5.9	1.0	3.0	0.8	1.1
1988-89	17.9	3.6	3.4	9.3	1.6	6.0	1.0	3.2	0.6	1.2
					Doctor's					
1968-69	17.7	11.3	5.8	0.5	0.1	5.3	0.1	2.6	2.5	0.1
1978-79	21.3	11.6	8.2	1.3	0.2	5.1	0.3	2.2	2.0	0.6
1988-89	21.5	10.9	8.4	1.9	0.3	5.1	0.3	2.6	1.5	0.7

Table V-12, 13, 14: Percent distribution of earned degrees, by field of study and level: 1968-69 to 1988-89 (cont.)

Year (1)	Total natural sciences and miscellaneous fields (2)	Mathematics and statistics (3)	Computer and information sciences (4)	Engineering (5)	Physical sciences (6)	Biological sciences (7)	Agriculture and natural resources (8)	Health professions (9)	Accounting (10	Business and management (11)	Education (12)
	C. Natural sciences and miscellaneous fields										
	Bachelor's										
1968-69	54.8	3.7	0.1	5.7	2.9	4.8	1.5	2.8	2.7	10.2	20.4
1978-79	57.5	1.2	0.8	6.2	2.5	5.7	2.5	6.4	4.7	13.2	14.3
1988-89	59.4	0.9	1.1	7.2	2.8	6.2	3.2	8.2	4.9	16.7	8.2
	Master's										
1968-69	67.1	3.0	0.5	7.9	3.0	3.0	1.3	2.1	0.7	9.4	36.2
1978-79	71.0	1.0	1.0	5.2	1.8	2.2	1.3	4.7	1.1	14.8	37.9
1988-89	68.0	0.8	1.4	5.4	2.0	2.2	1.7	6.5	1.3	16.4	30.3
	Doctor's										
1968-69	68.6	4.2	0.2	12.9	14.7	11.7	3.4	1.1	0.2	1.9	18.3
1978-79	61.7	2.3	0.6	7.3	9.5	10.5	3.1	2.1	0.2	2.7	23.4
1988-89	61.1	2.0	0.6	7.2	8.8	9.9	3.8	2.5	0.1	2.8	23.4

(I) less than (0.05)

NOTE: Data are for 50 States and the District of Columbia for all years.

Source: Frankel, Martin M., *Projections of Education Statistics to 1988-89*, pp. 63-65.

Table V-14 B: Earned bachelor's degrees for selected fields

Trends in the distribution of earned bachelor's degrees have roughly followed the projected majors of entering freshmen, with a time lag. Engineering and business have grown, while humanities, social sciences (including education), and mathematics have declined.

(Degrees in thousands)

Subject Area	1960-61	1965-66	1970-71	1975-76	1979-80*
Humanities and Related Fields	52	87	140	140	129
Social Sciences and Related Fields	136	226	382	369	323
Business and Management	56	64	116	143	174
Natural Sciences and Related Fields**	114	126	172	216	253
Biological Science	16	27	36	54	55
Computer Science	—	—	2	6	8
Engineering	36	38	50	46	74
Mathematics and Statistics	13	20	25	16	9
Physical Science	15	17	21	21	24

*Projected

**Includes agriculture and health fields in addition to those listed.

Source: *Projections of Education Statistics to 1987-88.*

Table V-14 C: Specialization of earned bachelor's degrees in mathematical sciences

From 1975 to 1980 earned bachelor's degrees in mathematics, statistics, and secondary teaching decreased by 42%. Computer science degrees increased by 145%. In universities 83% of computer science degrees are from computer science departments; in public colleges the fraction is 56%. However, many public colleges have joint mathematics and computer science departments.

(Numbers of bachelor's degrees)

Special Area	1974-75	1979-80
Mathematics	17,713	10,160
Statistics	570	467
Computer Science	3,636	8,917
Actuarial Science	70	146
Applied Mathematics	886	801
Secondary Teaching	4,778	1,752
Other	164	580

Source: Undergraduate Mathematical Sciences in Universities, Four-Year Colleges, and Two-Year Colleges, 1980-1981. James T. Fey and Wendell H. Fleming. Conference Board on Mathematical Sciences, 1981.

Chart V-15: Bachelor's degrees in science earned by women, 1951-52 to 1979-80

Except in sociology and mathematics, women have steadily increased their number of bachelor's degrees in science.

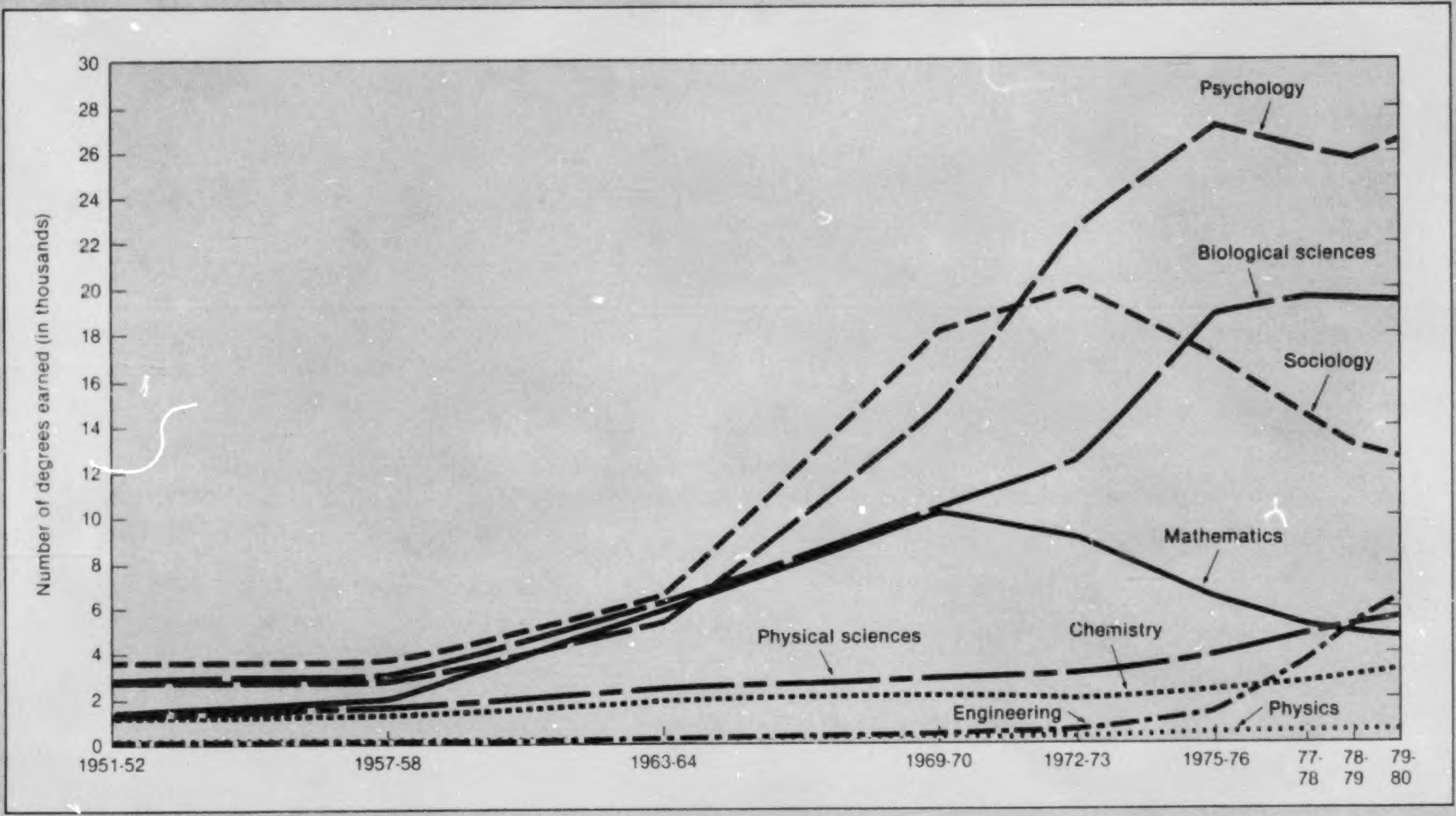


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Table V-15: Bachelor's degrees in science earned by women, 1951-52 to 1979-80

Year	Psychology	Biological sciences[1]	Sociology	Mathematics	Physical sciences[3]	Chemistry	Engineering	Physics
1951-52	2,816	2,882	3,681	1,322	1,319	1,089	60	106
1953-54	2,632	2,569	3,309	1,361	1,254	1,945	65	75
1955-56	2,519	2,908	3,343	1,518	1,484	1,171	76	101
1957-58	2,829	3,149	3,596	1,962	1,658	1,297	109	141
1959-60	3,288	3,922	3,985	3,106	1,994	1,580	142	168
1961-62	3,780	4,779	4,514	4,239	2,123	1,692	121	188
1963-64	5,441	6,402	6,506	5,968	2,412	1,886	151	232
1965-66	6,895	7,548	8,934	6,651	2,307	1,776	143	223
1967-68	10,027	8,840	13,241	8,731	2,641	1,932	209	293
1969-70	14,564	10,385	18,074	10,265	2,917	2,066	330	327
1970-71	16,851	10,410	19,653	9,432	2,953	2,037	400	342
1971-72	19,934	10,970	19,985	9,269	3,081	2,057	526	320
1972-73	22,719	12,597	19,856	9,271	3,070	1,920	613	310
1973-74	26,116	15,095	20,292	8,844	3,504	2,085	796	334
1974-75	26,798	17,129	18,279	7,595	3,786	2,339	1,014	359
1975-76	27,076	18,755	16,389	6,509	4,112	2,472	1,460	388
1976-77	27,102	19,387	15,187	5,893	4,501	2,556	2,218	358
1977-78	26,211	19,797	14,428	5,171	4,896	2,797	3,709	369
1978-79	25,997	19,655	13,248	4,907	5,222	3,051	5,174	399
1979-80	26,543	19,542	12,611	4,816	5,546	3,182	6,405	434

[1] Includes degrees in anatomy, bacteriology, biochemistry, biology, botany, entomology, physiology, zoology, and other biological sciences.

[2] Includes degrees conferred in statistics.

[3] Includes degrees in astronomy, chemistry, geology, metallurgy, meterology, physics, and other physical sciences.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, pp. 120-22, *1977-78*, pp. 118-19, and U.S. Department of Health, Education and Welfare, National Center for Education Statistics, reports on *Earned Degrees Conferred; IBID.*, 1980 pp. 120-24.

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Chart V-16: Master's degrees in science earned by women, 1951-52 to 1979-80

Except in mathematics, chemistry, sociology, and physics, women have steadily increased their number of master's degrees in science.

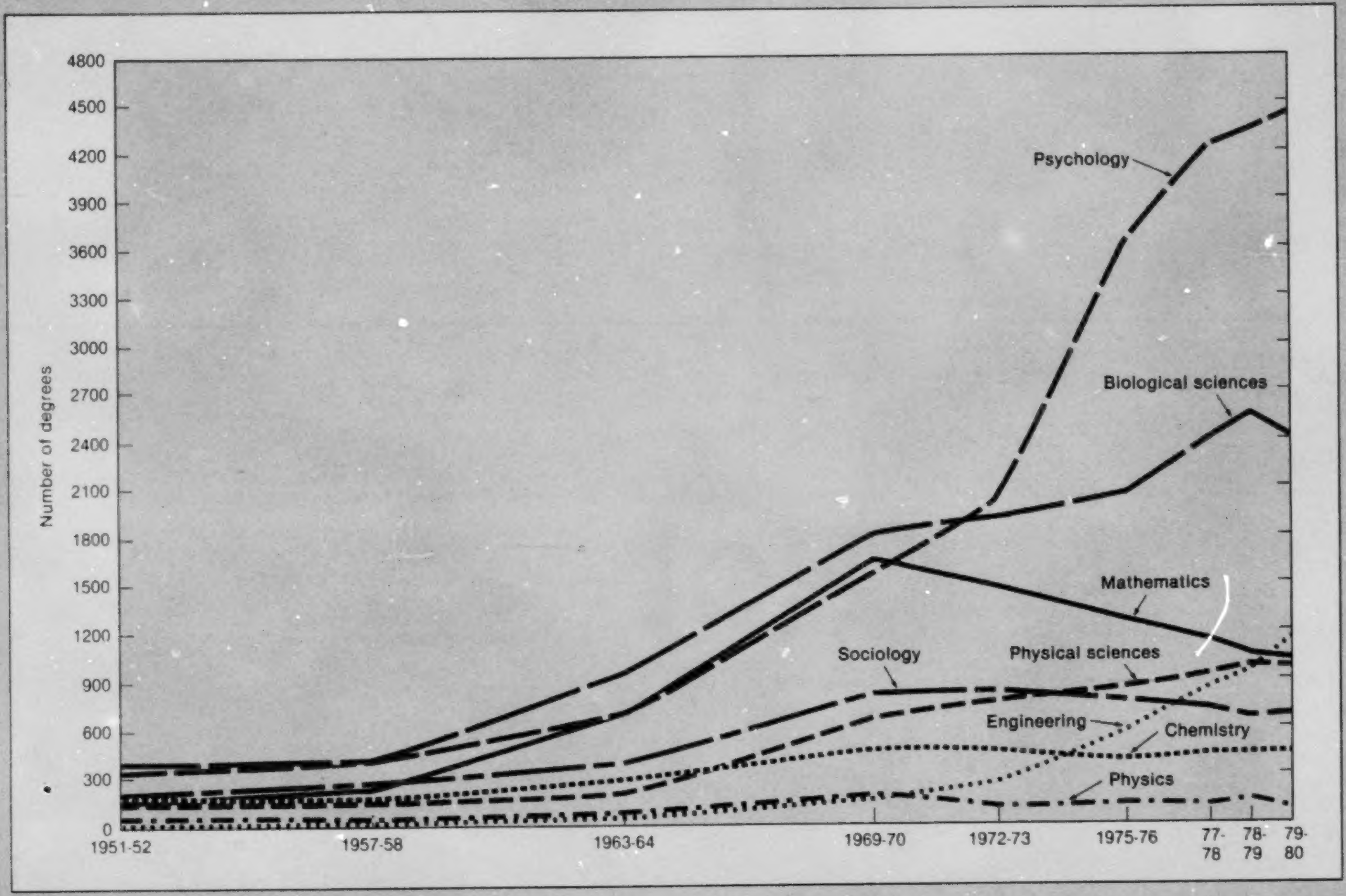

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Table V-16: Master's degrees in science earned by women, 1951-52 to 1979-80

Year	Psychology	Biological science[1]	Sociology	Mathematics[2]	Physical sciences[3]	Chemistry	Engineering	Physics
1951-52	340	399	131	139	224	167	18	35
1953-54	369	323	117	127	177	126	15	29
1955-56	283	380	127	179	220	129	19	23
1957-58	399	404	139	240	271	167	20	25
1959-60	425	486	113	335	327	203	26	35
1961-62	563	660	156	501	384	239	40	62
1963-64	688	948	180	686	406	275	34	66
1965-66	850	1,147	301	1,000	525	347	76	80
1967-68	1,158	1,547	403	1,328	630	402	99	45
1969-70	1,562	1,825	675	1,670	842	473	172	157
1970-71	1,643	1,923	677	1,518	846	488	185	150
1971-72	2,030	2,014	753	1,543	883	500	272	159
1972-73	2,335	1,909	777	1,503	843	464	278	113
1973-74	2,617	1,997	869	1,497	876	464	356	135
1974-75	3,022	1,963	808	1,422	838	406	375	124
1975-76	3,640	2,085	814	1,310	318	377	582	132
1976-77	4,004	2,396	812	1,299	381	443	720	126
1977-78	4,241	2,406	733	1,145	941	441	865	123
1978-79	4,331	2,566	670	1,051	990	445	951	135
1979-80	4,430	2,412	674	1,032	971	444	1,142	118

[1] Includes degrees in anatomy, bacteriology, biochemistry, biology, botany, entomology, physiology, zoology, and other biological sciences.

[2] Includes degrees conferred in statistics.

[3] Includes degrees in astronomy, chemistry, geology, metallurgy, meterology, physics, and other physical sciences.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, pp. 120-22, *1977-78*, pp. 118-19, and U.S. Department of Health, Education and Welfare, National Center for Education Statistics, reports on *Earned Degrees Conferred; IBID.* 1980, p. 120-134.

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first-professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Chart V-17: Doctor's degrees in science earned by women, 1951-52 to 1979-80

Women have steadily increased their number of doctor's degrees in all areas of science.

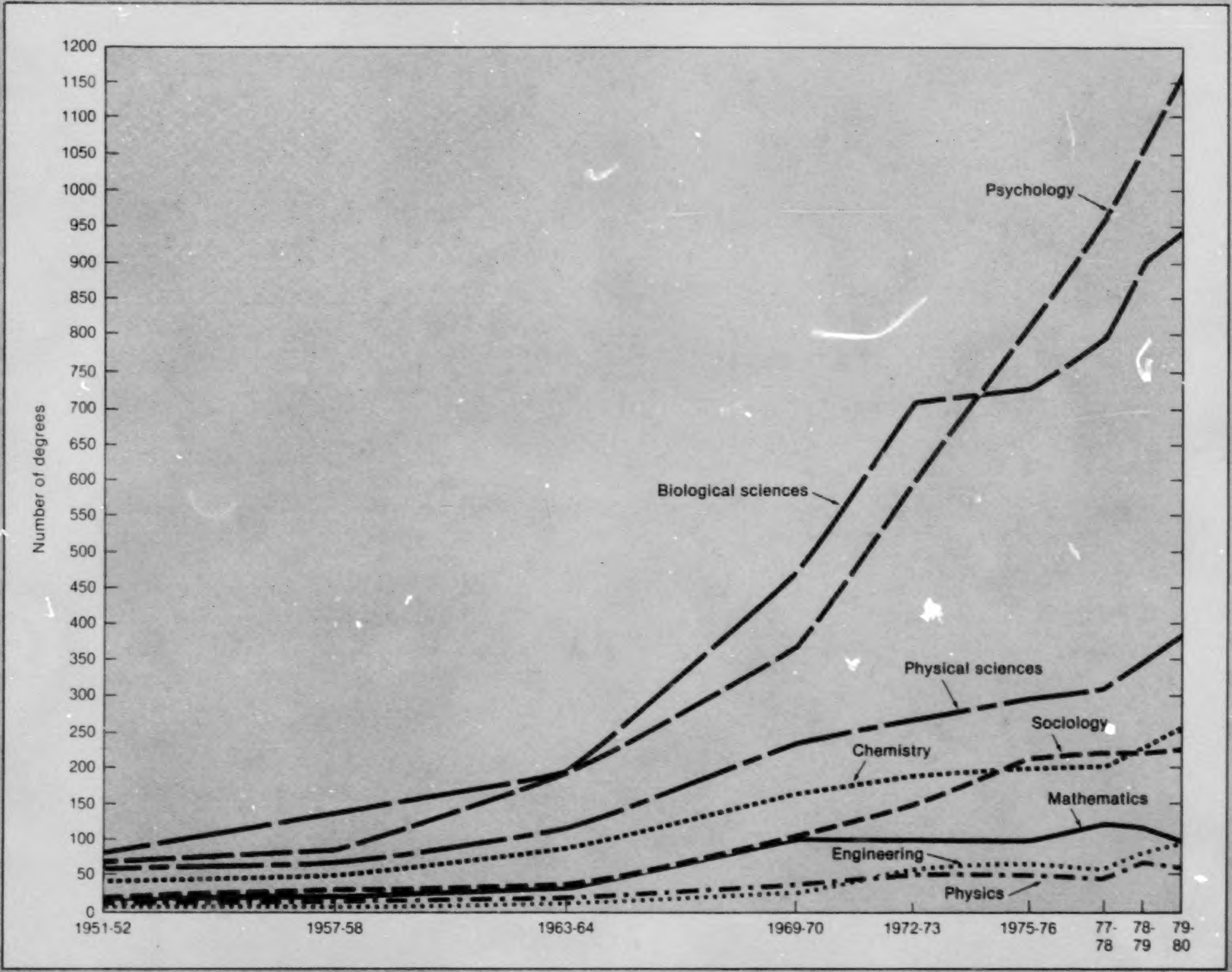


Table V-17: Doctor's degrees in science earned by women, 1951-52 to 1979-80

Year	Psychology	Biological science[1]	Sociology	Mathematics[2]	Physical sciences[3]	Chemistry	Engineering	Physics
1951-52	73	84	20	11	57	45	3	9
1953-54	66	100	23	14	61	45	—	6
1955-65	86	117	29	10	68	52	—	8
1957-58	84	138	28	15	66	49	4	9
1959-60	97	119	26	18	62	46	3	10
1961-62	149	159	26	24	87	69	4	12
1963-64	182	193	29	29	113	92	7	11
1965-66	220	305	36	57	131	91	9	21
1967-68	286	439	68	52	188	139	12	26
1969-70	372	469	104	96	235	166	24	37
1970-71	427	595	119	93	246	173	23	43
1971-72	467	622	136	89	273	193	22	43
1972-73	605	710	154	102	268	178	54	51
1973-74	691	699	177	100	253	173	55	49
1974-75	754	743	209	110	301	204	66	52
1975-76	819	729	218	94	299	196	66	45
1976-77	991	726	234	109	319	187	73	55
1977-78	966	798	223	124	312	203	57	49
1978-79	1,065	906	221	122	350	230	83	66
1979-80	1,166	946	228	100	384	258	95	63

[1] Includes degrees in anatomy, bacteriology, biochemistry, biology, botany, entomology, physiology, zoology, and other biological sciences.

[2] Includes degrees conferred in statistics.

[3] Includes degrees in astronomy, chemistry, geology, metallurgy, meterology, physics, and other physical sciences.

Source: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, pp. 120-22, 1977-78, pp. 118-119. U.S. Department of Health, Education and Welfare, National Center for Education Statistics, reports on *Earned Degrees Conferred. IBID*, 1980, pp. 120-24.

NOTE: Although a strenuous effort has been made to provide a consistent series of data, minor changes have occurred over time in the way degrees are classified and reported. Any degrees classified in early surveys as "first professional" are included above with bachelor's degrees; any degrees classified as "second professional" or "second level" are included with master's degrees. Data for all years are for 50 States and the District of Columbia.

Chart V-18: Percent of bachelor's degrees in science earned by women, 1951-52 to 1979-80

As a percent of total bachelor's degrees, the female share continues to grow in every scientific discipline. The relative position of the fields is stable; however, sociology and psychology have had and continue to have the most degrees, physics and engineering, least.

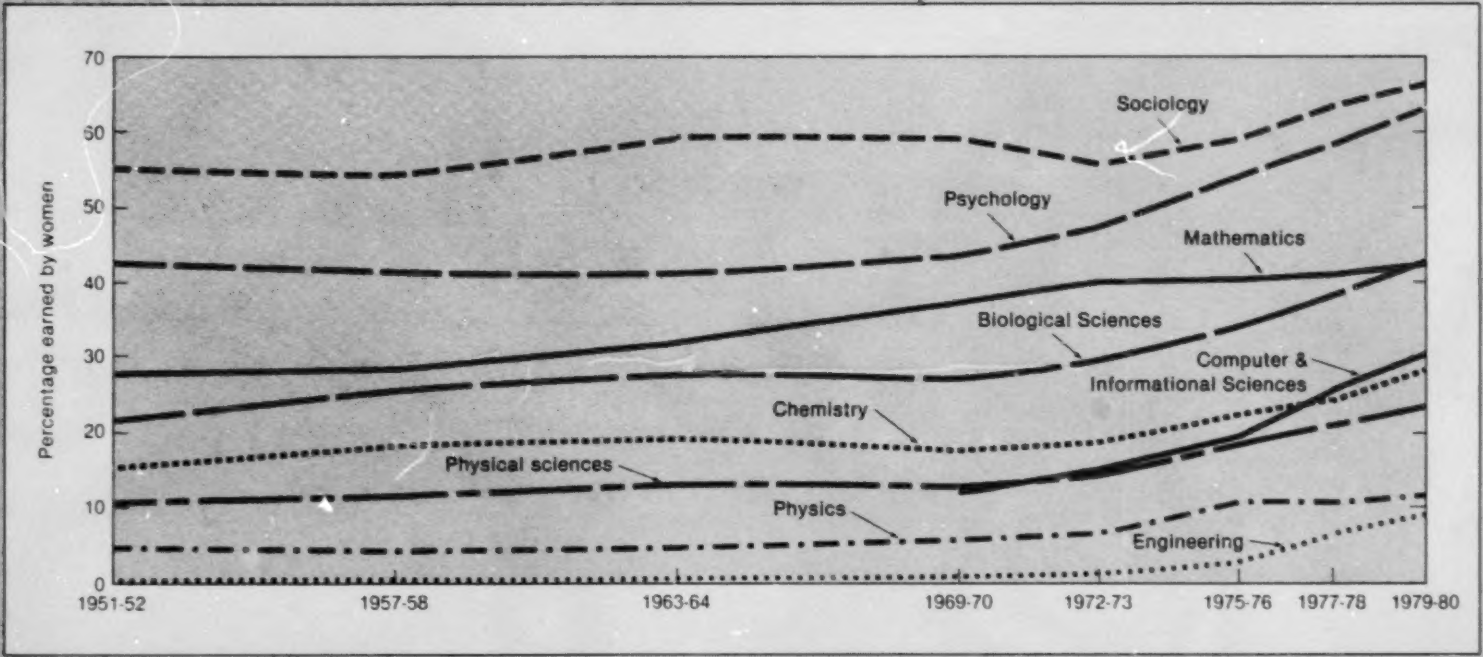


Table V-18: Percent of bachelor's degrees in science earned by women, 1951-52, 1979-80

	1951-52	1957-58	1963-64	1969-70	1972-73	1975-76	1977-78	1979-80
Mathematics	28.1%	28.4%	32 %	37.4%	40.2%	40.7%	41.1%	42.2%
Physics	4.7	4.4	4.7	6.1	7.0	10.9	10.9	12.1
Physical sciences	10.8	11.6	13.8	13.6	14.8	19.1	21.3	23.9
Biological sciences	26.0	22.0	28.1	27.8	29.8	34.6	38.4	42.2
Psychology	42.7	41.1	41.0	43.3	47.6	54.2	58.8	63.3
Sociology	55.3	54.7	59.4	59.3	56.0	59.3	63.4	66.7
Engineering	.2	.3	.4	.7	1.2	3.1	6.7	9.3
Chemistry	16.0	18.6	19.5	17.9	19.0	22.4	24.7	28.6
Computer & Information Sciences . . .	†	†	†	12.9*	14.9	19.8	25.7	30.3

*Called Computer Science & Systems Analysis in 1969-70.

†Data not collected.

Source: National Science Foundation, Office of Program Integration, unpublished data based on: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, pp. 120-22. *1977-78*, pp. 118-19 and Grant, W. Vance and Eiden, Leo J. *Digest of Education Statistics*, 1980, pp. 120-124 nd Unpublished NCES Data.

Chart V-19: Percent of master's degrees in science earned by women, 1951-52 to 1979-80

Women's share of total master's degrees is at its all time high for every scientific discipline.

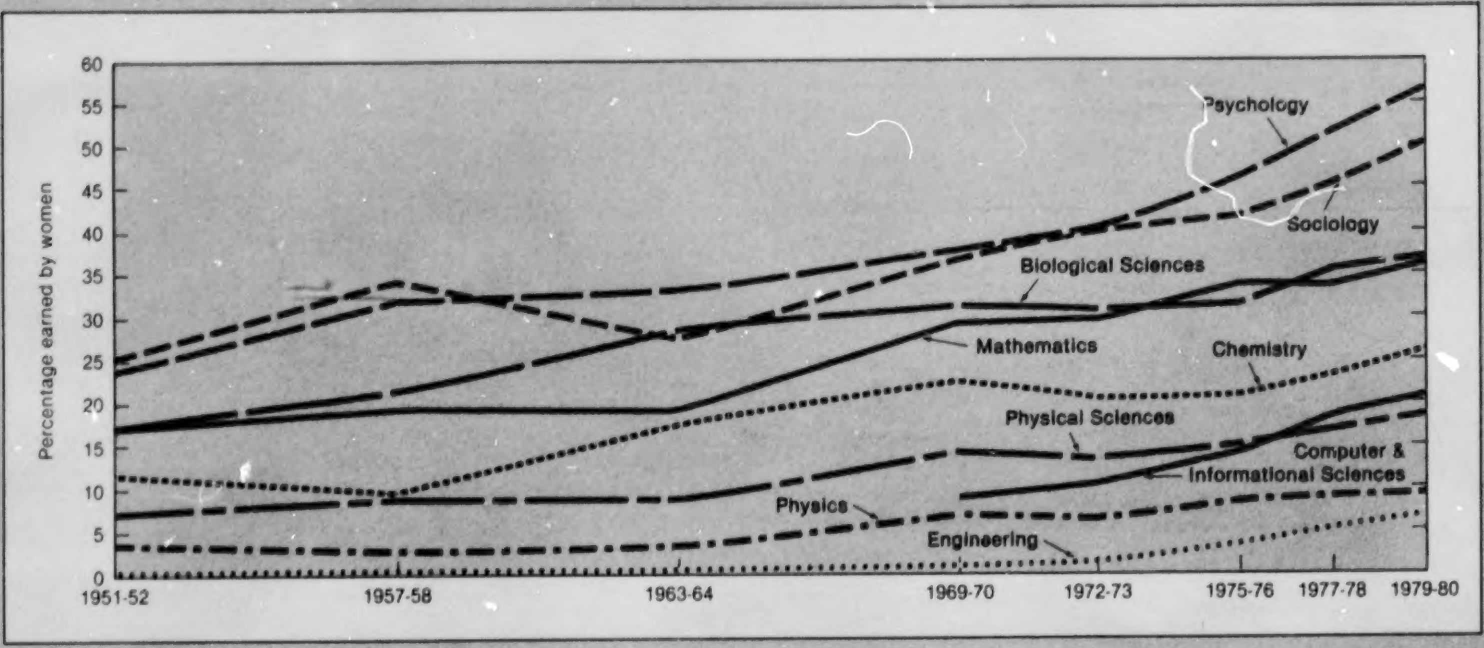


Table V-19: Percent of master's degrees in science earned by women, 1951-52 to 1979-80

	1951-52	1957-58	1963-64	1969-70	1972-73	1975-76	1977-78	1979-80
Mathematics	17.3%	19.4%	19.1%	29.6%	29.9%	34.0%	33.9%	36.1%
Physics	4.0	3.1	3.6	7.1	6.5	9.1	9.3	9.7
Physical sciences	7.3	8.9	8.9	14.2	13.5	15.0	16.9	18.6
Biological sciences	17.3	21.8	28.8	31.5	30.5	31.7	35.4	37.1
Psychology	24.2	32.3	33.4	38.0	40.1	46.6	52.0	56.8
Sociology	25.3	35.0	27.9	37.2	40.4	42.0	45.5	50.3
Engineering	.4	.3	.3	1.1	1.7	3.6	5.3	7.0
Chemistry	11.9	9.7	17.6	22.4	20.9	21.1	23.2	26.1
Computer & Information Sciences	†	†	†	9.3*	10.6	14.5	18.7	20.9

*Called Computer Science & Systems Analysis in 1969-70.

†Data not collected.

Source: National Science Foundation, Office of Program Integration, unpublished data based on: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, pp. 120-22, 1977-78, pp. 118-19 and Grant, W. Vance and Eiden, Leo J. *Digest of Education Statistics*, 1980, pp. 120-124 and Unpublished NCES Data.

Chart V-20: Percent of doctor's degrees in science earned by women, 1951-52 to 1979-80

As a percent of total doctor's degrees, the female share is now at an all time high for every scientific discipline, except computer and information science.

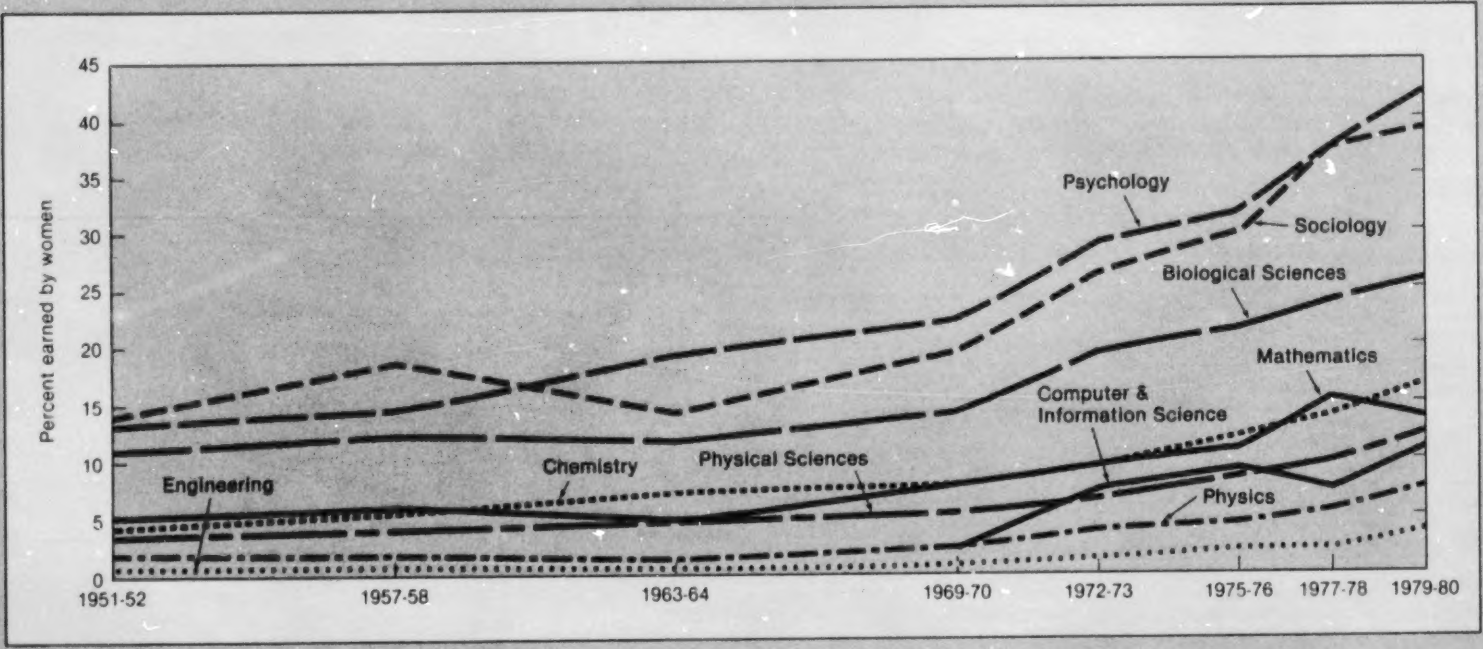


Table V-20 A: Percent of doctor's degrees in science earned by women, 1951-52 to 1979-80

	1951-52	1957-58	1963-64	1969-70	1972-73	1975-76	1977-78	1979-80
Mathematics	5.3%	6.1%	4.7%	7.8%	9.6%	11.0%	15.4%	13.8%
Physics	1.9	1.9	1.4	2.6	3.8	4.5	5.6	7.6
Physical sciences‡	3.3	4.0	4.7	5.4	6.7	8.7	10.0	12.5
Biological sicences	11.0	12.3	11.9	14.3	19.5	21.5	24.1	26.0
Psychology	13.5	14.7	19.4	22.3	29.0	31.7	37.3	42.2
Sociology	14.2	18.7	14.6	19.5	26.4	29.9	37.2	39.1
Engineering	.7	.6	.4	.7	1.5	2.3	2.3	3.8
Chemistry	4.4	5.2	7.2	7.7	9.5	12.1	13.9	16.6
Computer & Information Sciences	†	†	†	1.9*	7.7	9.4	7.7	11.2

*Called Computer Science & Systems Analysis in 1969-70.

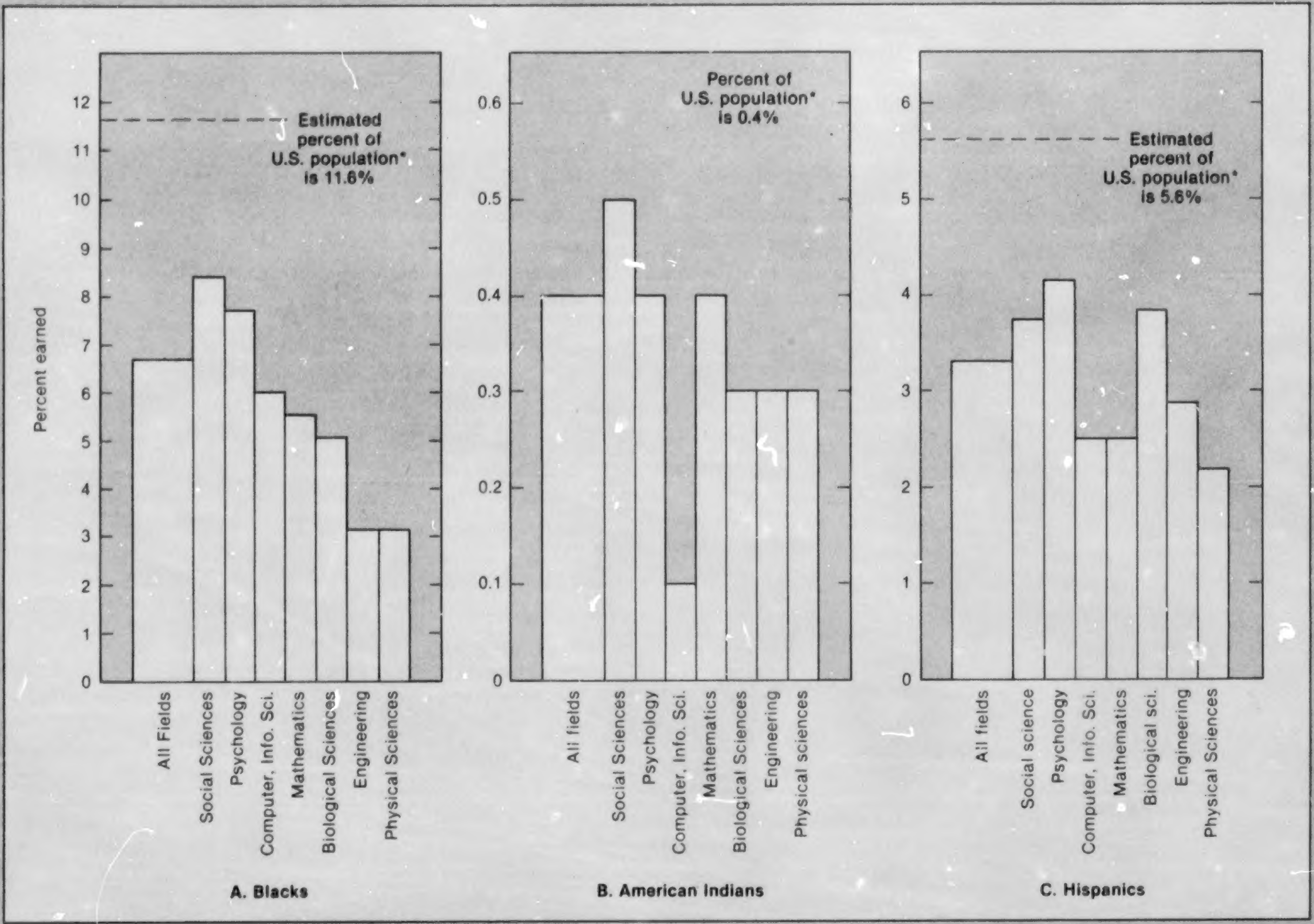
†Data not collected.

‡Includes physics and chemistry.

Source: National Science Foundation, Office of Program Integration, unpublished data based on: Grant, W. Vance and Lind, C. George, *Digest of Education Statistics, 1979*, pp. 120-22, 1977-78, pp. 118-19 and Grant, W. Vance and Eiden, Leo J. *Digest of Education Statistics*, 1980, pp. 120-124.

Charts V-21, A, B & C: Percent of bachelor's degrees in science earned by minorities and by field, 1978-79

Minorities earn more degrees in psychology and social sciences than in physical sciences. American Indians earn degrees in an amount more representative of their share of the population than do blacks or Hispanics.



A. Blacks **B. American Indians** **C. Hispanics**

*NOTE: Figures for the Black and Hispanic populations are from the March 1978 Current Population Survey, and therefore are estimates. The population figure for American Indians is from the 1970 Census. Also, persons of Hispanic origin may be of any race.

Table V-21: Percent of bachelor's degrees in science earned by minorities, by field, 1978-79

	All Fields	Science	Psychology	Computer	Mathematics	Biology	Engineering	Physics
Blacks	6.6	8.4	7.6	6.0	5.6	5.1	3.1	3.1
American Indian	0.4	0.5	0.4	0.1	0.4	0.3	0.3	0.3
Hispanic	3.3	3.6	4.1	2.5	2.5	3.7	2.7	2.2

Source: This table was derived from various National Center for Education Statistics Reports.

Table V-22: Degrees granted by all higher education institutions, by science and engineering field and minority status (excluding non-resident aliens) 1975-76 and 1978-79

A-1: Bachelor's Degrees — Minority Status within Field

		Total		Black, Non-Hispanic		Amer. Ind./ Alask. Nat.		Asian or Pacific Is.		Hispanic		White, Non-Hispanic	
		75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79
	No.	978,432	911,637	58,093	60,301	3,482	3,410	10,994	15,542	17,801	29,719	888,062	802,665
All Fields	%	100.0	100.0	5.9	6.6	0.4	0.4	1.1	1.7	1.8	3.3	90.8	88.0
Biological		53,341	48,674	2,228	2,491	140	149	1,200	1,464	858	1,825	48,915	42,745
Sciences		100.0	100.0	4.2	5.1	0.3	0.3	2.2	3.0	1.6	3.7	91.7	87.8
Computer &		5,382	8,392	322	507	7	11	122	263	87	207	4,844	7,404
Information Sci.		100.0	100.0	6.0	6.0	0.1	0.1	2.3	3.1	1.6	2.5	90.0	88.2
		42,526	58,003	1,317	1,775	150	164	963	1,858	837	1,555	39,259	52,651
Engineering		100.0	100.0	3.1	3.1	0.4	0.3	2.3	3.2	2.0	2.7	92.3	90.8
		20,706	22,659	624	704	62	63	308	439	284	495	19,428	20,958
Physical Sciences		100.0	100.0	3.0	3.1	0.3	0.3	1.5	1.9	1.4	2.2	93.8	92.5
		15,582	11,534	781	652	54	41	307	324	243	288	14,197	10,229
Mathematics		100.0	100.0	5.0	5.7	0.4	0.4	2.0	2.8	1.6	2.5	91.1	88.7
		49,378	42,561	3,131	3,218	191	177	593	781	1,243	1,737	44,220	36,648
Psychology		100.0	100.0	6.3	7.6	0.4	0.4	1.2	1.8	2.5	4.1	89.6	86.1
		124,712	107,604	10,716	9,050	509	498	1,345	1,627	2,992	3,912	109,150	92,517
Social Sciences		100.0	100.0	8.6	8.4	0.4	0.5	1.1	1.5	2.4	3.6	87.5	86.0

Sources: All tables in this series derived by Joel Aronson from various National Center for Education Statistics reports.

Table V-23: Degrees granted by all higher education institutions, by science and engineering field and minority status (excluding non-resident aliens) 1975-76 and 1978-79

A-2: Bachelor's Degrees — Field within minority status

		Total		Black, Non-Hispanic		Amer. Ind./ Alask. Nat.		Asian or Pacific Is.		Hispanic		White, Non-Hispanic	
		75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79
All Fields	No.	978,432	911,637	58,093	60,301	3,482	3,410	10,994	15,5[illegible]2	17,801	29,719	888,062	802,665
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Biological Sciences		53,341	48,674	2,228	2,491	140	149	1,200	1,464	858	1,825	48,915	42,745
		5.5	5.3	3.8	4.1	4.0	5.3	10.9	9.4	4.8	6.3	5.5	5.5
Computer & Information Sci.		5,382	8,392	322	507	7	11	122	263	87	207	4,844	7,404
		0.6	0.9	0.6	0.8	0.2	0.3	1.1	1.7	0.5	0.7	0.6	0.9
Engineering		42,526	58,003	1,317	1,775	150	164	963	1,858	837	1,555	39,259	52,651
		4.3	6.4	2.3	2.9	4.3	4.8	8.8	12.0	4.7	5.2	4.4	6.6
Physical Sciences		20,706	22,659	624	704	62	63	308	439	284	495	19,428	20,958
		2.1	2.5	1.1	1.2	1.8	1.8	2.8	2.8	1.6	1.7	2.2	2.6
Mathematics		15,582	11,534	781	652	54	41	307	324	243	288	14,197	10,229
		1.6	1.3	1.3	1.1	1.6	1.2	2.8	2.1	1.4	1.0	1.6	1.3
Psychology		49,378	42,561	3,131	3,218	191	177	593	781	1,243	1,737	44,220	36,648
		5.0	4.7	5.4	5.3	5.5	5.2	5.4	5.0	7.0	5.8	5.0	4.6
Social Sciences		124,712	107,604	10,716	9,050	509	498	1,345	1,627	2,992	3,912	109,150	92,517
		12.7	11.8	18.4	15.0	14.6	14.6	12.2	10.5	16.8	13.2	12.3	11.5
Total %, Science and Engineering		31.8	32.9	32.9	30.4	32.0	33.2	44.0	43.5	36.8	33.9	31.6	32.8

Sources: All tables in this series derived by Joel Aronson from various National Center for Education Statistics reports.

Table V-24: Degrees granted by all higher education institutions, by science and engineering field and minority status (excluding non-resident aliens) 1975-76 and 1978-79

B-1: Master's Degrees — Minority Status within Field

	Total		Black, Non-Hispanic		Amer. Ind./ Alask. Nat.		Asian or Pacific Is.		Hispanic		White, Non-Hispanic	
	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79
No.	295,363	281,811	19,906	19,422	774	999	3,861	5,519	5,158	6,470	265,664	249,401
All Fields . . . . %	100.0	100.0	6.7	7.0	0.3	0.4	1.3	2.0	1.7	2.3	89.9	88.8
Biological	6,191	6,415	206	217	15	16	124	205	55	115	5,791	5,862
Sciences	100.0	100.0	3.3	3.4	0.2	0.3	2.0	3.2	0.9	1.8	93.5	91.4
Computer &	2,235	2,528	54	65	7	16	66	149	15	25	2,093	2,273
Information Sci.	100.0	100.0	2.4	2.6	0.3	0.6	3.0	5.9	0.7	1.0	93.6	89.9
	12,561	11,417	208	246	38	24	487	850	219	215	11,609	10,802
Engineering	100.0	100.0	1.7	2.2	0.3	0.2	3.9	7.4	1.7	1.9	92.4	88.3
	4,776	4,713	127	86	9	29	138	160	53	65	4,449	4,373
Physical Sciences	100.0	100.0	2.7	1.8	0.2	0.6	2.9	3.4	1.1	1.4	93.2	92.8
	3,562	2,571	119	71	8	8	93	104	51	34	3,291	2,352
Mathematics	100.0	100.0	3.3	2.8	0.2	0.3	2.6	4.0	1.4	1.3	92.4	91.5
	7,624	7,852	409	476	14	20	88	87	183	191	6,930	7,078
Psychology	100.0	100.0	5.4	6.1	0.2	0.3	1.2	1.1	2.4	2.4	90.9	90.1
	14,625	11,423	858	748	37	45	193	236	278	276	13,259	10,118
Social Sciences	100.0	100.0	5.9	6.5	0.3	0.4	1.3	2.1	1.9	2.4	90.7	88.6

Sources: All tables in this series derived by Joel Aronson from various National Center for Education Statistics reports.

Table V-25: Degrees granted by all higher education institutions, by science and engineering field and minority status (excluding non-resident aliens) 1975-76 and 1978-79

B-2: Master's Degrees — Field within Minority Status

		Total		Black, Non-Hispanic		Amer. Ind./ Alask. Nat.		Asian or Pacific Is.		Hispanic		White, Non-Hispanic	
		75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79
All Fields	No.	295,363	281,811	19,906	19,422	774	999	3,861	5,519	5,158	6,470	265,664	249,401
	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Biological Sciences		6,191	6,415	206	217	15	16	124	205	55	115	5,791	5,862
		2.1	2.3	1.0	1.1	1.9	1.6	3.2	3.7	1.7	1.8	2.2	2.4
Computer & Information Sci.		2,235	2,528	54	65	7	16	66	149	15	25	2,093	2,273
		0.8	0.9	0.3	0.3	0.9	1.6	1.7	2.7	0.3	0.4	0.8	0.9
Engineering		12,561	11,417	208	246	38	24	487	850	219	215	11,609	10,802
		4.3	4.1	1.0	1.3	4.9	2.4	12.6	15.4	4.2	3.3	4.4	4.0
Physical Sciences		4,776	4,713	127	86	9	29	138	160	53	65	4,449	4,373
		1.6	1.7	0.6	0.4	1.2	2.9	3.6	2.9	1.0	1.0	1.7	1.8
Mathematics		3,562	2,571	119	71	8	8	93	104	51	34	3,291	2,352
		1.2	0.9	0.6	0.4	1.0	0.8	2.4	1.9	1.0	0.5	1.2	0.9
Psychology		7,624	7,852	409	476	14	20	88	87	183	191	6,930	7,078
		2.6	2.8	2.1	2.5	1.8	2.0	2.3	1.6	3.5	3.0	2.6	2.8
Social Sciences		14,625	11,423	858	748	37	45	193	236	278	276	13,259	10,118
		5.0	4.1	4.3	3.9	4.8	4.5	5.0	4.3	5.4	4.3	5.0	4.1
Total %, Science and Engineering		17.6	16.8	9.9	9.9	16.5	15.8	30.8	32.5	17.1	14.3	17.9	16.9

Sources: All tables in this series derived by Joel Aronson from various National Center for Education Statistics reports.

Table V-26: Degrees granted by all higher education institutions, by science and engineering field and minority status (excluding non-resident aliens) 1975-76 and 1978-79

C-1 Doctor's Degrees — Minority Status within Field

		Total		Black, Non-Hispanic		Amer. Ind./ Alask. Nat.		Asian or Pacific Is.		Hispanic		White, Non-Hispanic	
		75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79
All Fields	No.	30,056	28,774	1,164	1,268	93	104	541	811	383	453	27,875	26,138
	%	100.0	100.0	3.9	4.4	0.3	0.4	1.8	2.8	1.3	1.6	92.7	90.8
Biological Sciences		3,046	3,205	43	47	4	6	84	127	22	34	2,893	2,991
		100.0	100.0	1.4	1.5	0.1	0.2	2.8	4.0	0.7	1.1	95.0	93.3
Computer & Information Sci.		198	188	—	4	1	—	4	8	1	1	192	175
		100.0	100.0	—	2.1	0.5	—	2.0	4.2	0.5	0.5	97.0	93.1
Engineering		1,822	1,635	17	25	3	2	117	183	16	22	1,669	1,403
		100.0	100.0	0.9	1.5	0.2	0.1	6.4	11.2	0.9	1.3	91.6	85.8
Physical Sciences		2,860	2,617	31	48	8	8	85	121	27	25	2,709	2,415
		100.0	100.0	1.1	1.8	0.3	0.3	3.0	4.6	0.9	1.0	94.7	92.3
Mathematics		696	568	8	13	1	—	20	29	11	6	656	520
		100.0	100.0	1.1	2.3	0.1	—	2.9	5.1	1.6	1.1	94.3	91.5
Psychology		2,495	2,588	62	111	4	10	20	23	39	64	2,370	2,380
		100.0	100.0	2.5	4.3	0.2	0.4	0.8	0.9	1.6	2.5	95.0	92.0
Social Sciences		3,661	2,931	110	132	8	17	37	65	40	39	3,466	2,678
		100.0	100.0	3.0	4.5	0.2	0.6	1.0	2.2	1.1	1.3	94.7	91.4

Sources: All tables in this series derived by Joel Aronson from various National Center for Education Statistics reports.

Table V-27: Degrees granted by all higher education institutions, by science and engineering field and minority status (excluding non-resident aliens) 1975-76 and 1978-79

C-2: Doctor's Degrees — Field within Minority Status

		Total		Black, Non-Hispanic		Amer. Ind./ Alask. Nat.		Asian or Pacific Is.		Hispanic		White, Non-Hispanic	
		75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79	75-76	78-79
	No.	30,056	28,774	1,164	1,268	93	104	541	811	383	453	27,875	26,13
All Fields	%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.
Biological		3,046	3,205	43	47	4	6	84	127	22	34	2,893	2,99
Sciences		10.1	11.1	3.7	3.7	4.3	5.8	15.5	15.7	5.7	7.5	10.4	11.
Computer &		198	188	—	4	1	—	4	8	1	1	192	17
Information Sci.		0.7	0.7	—	0.3	1.1	—	0.7	1.0	0.3	0.2	0.7	0.
		1,822	1,635	17	25	3	2	117	183	16	22	1,669	1,40
Engineering		6.1	5.7	1.5	2.0	3.2	1.9	21.6	22.6	4.2	4.9	6.0	5.
		2,860	2,617	31	48	8	8	85	121	27	25	2,709	2,41
Physical Sciences		9.5	9.1	2.7	3.8	8.6	7.7	15.7	14.9	7.0	5.5	9.7	9.
		696	568	8	13	1	—	20	29	11	6	656	52
Mathematics		2.3	2.0	0.7	1.0	1.1	—	3.7	3.6	2.9	1.3	2.4	2.
		2,495	2,588	62	111	4	10	20	23	39	64	2,370	2,38
Psychology		8.3	9.0	5.3	8.8	4.3	9.6	3.7	2.8	10.2	14.1	8.5	9.
		3,661	2,931	110	132	8	17	37	65	40	39	3,466	2,67
Social Sciences		12.2	10.2	9.5	10.4	8.6	16.3	6.8	8.0	10.4	8.6	12.4	10.
Total %, Science and Engineering		49.2	47.8	23.4	30.0	31.2	41.3	67.7	68.6	40.7	42.1	50.1	48.

Sources: All tables in this series derived by Joel Aronson from various National Center for Education Statistics reports.

Chapter VI
EMPLOYMENT IN SCIENCE AND ENGINEERING

INTRODUCTION

A full understanding of American science education requires that it be related to the context of American society. To what uses do individuals put their science education? Of what use to society is their science education? Most of the data available helps answer the first question and presented here are what seem relevant and useful of that data.

Data in this chapter are presented in two groups: employment and salaries.

HIGHLIGHTS

1. More than half of all doctoral scientists and engineers are employed by educational institutions. (Chart VI-1)
2. Approximately 32% of doctoral scientists and engineers are engaged in R&D as their primary work activity. (Chart VI-2)
3. In general, female scientists and engineers have a higher unemployment rate than males. (Charts VI-3, 4)
4. Male scientists and engineers claim a greater degree of underemployment than females. (Chart VI-5)
5. From 1965-78, male scientists and engineers outearned women scientists and engineers in most fields at all levels; in 1979 median annual salaries for baccalaureate recipients were less divergent. (Charts VI-7 to 11)
6. Beginning salary offers are highest in engineering. (Chart VI-10)

Chart VI-1: Employers of doctoral scientists and engineers, 1973 and 1979

More than half of all doctoral scientists and engineers are employed by educational institutions. No significant trends developed between 1973 and 1979.

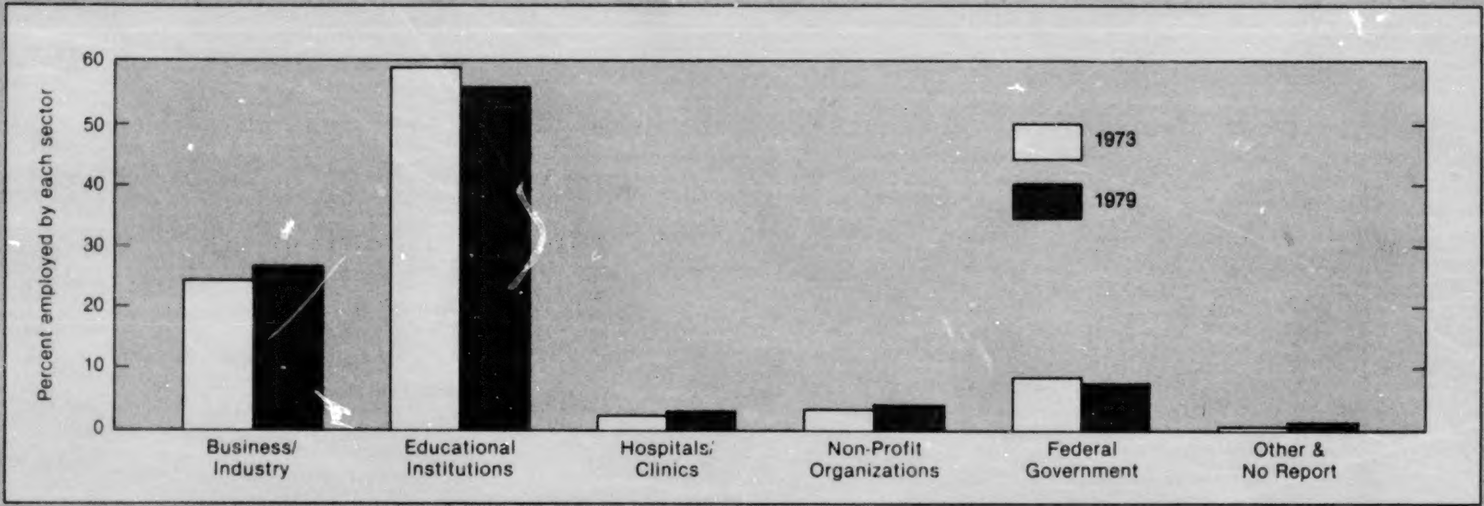


Table VI-1: Employers of doctoral scientists and engineers, 1973, 1975, 1977 and 1979

Characteristics	1973 Number	1973 Percent	1975 Number	1975 Percent	1977 Number	1977 Percent	1979 Number	1979 Percent
Total Employed	220,410	100.0	256,045	100.0	284,312	100.0	313,736	100.0
Type of Employment								
Science/Engineering ...	206,230	93.6	240,100	93.8	261,099	91.8	287,082	91.5
Other/Unknown Field ...	14,180	6.4	15,945	6.2	23,213	8.2	26,654	8.5
Sector of Employment								
Business/Industry	53,403	24.2	64,627	25.2	71,475	25.1	82,824	26.4
Educational Institutions	129,408	58.7	149,184	58.3	163,140	57.4	173,966	55.4
Hospitals/Clinics	4,543	2.1	7,469	2.9	8,587	3.0	9,706	3.1
Nonprofit Organizations	8,006	3.6	8,337	3.3	10,198	3.6	12,549	4.0
Federal Government	18,200	8.3	18,995	7.4	21,368	7.5	23,923	7.6
Other	331	.2	82	*	584	.2	945	.3
No Report	286	.1	326	.1	1,350	.5	1,401	.4

*Less than .05 percent.

Source: *Characteristics of Doctoral Scientists and Engineers in the United States: 1979*, NSF 80-323, p. 3.

Chart VI-2: Primary work activity of doctoral scientists and engineers, 1973 and 1979

R&D activities account for approximately 32% of primary work activities among doctoral scientists and engineers. Between 1973 and 1979, there was a 19.3% relative decline in those reporting teaching as their primary work activity.

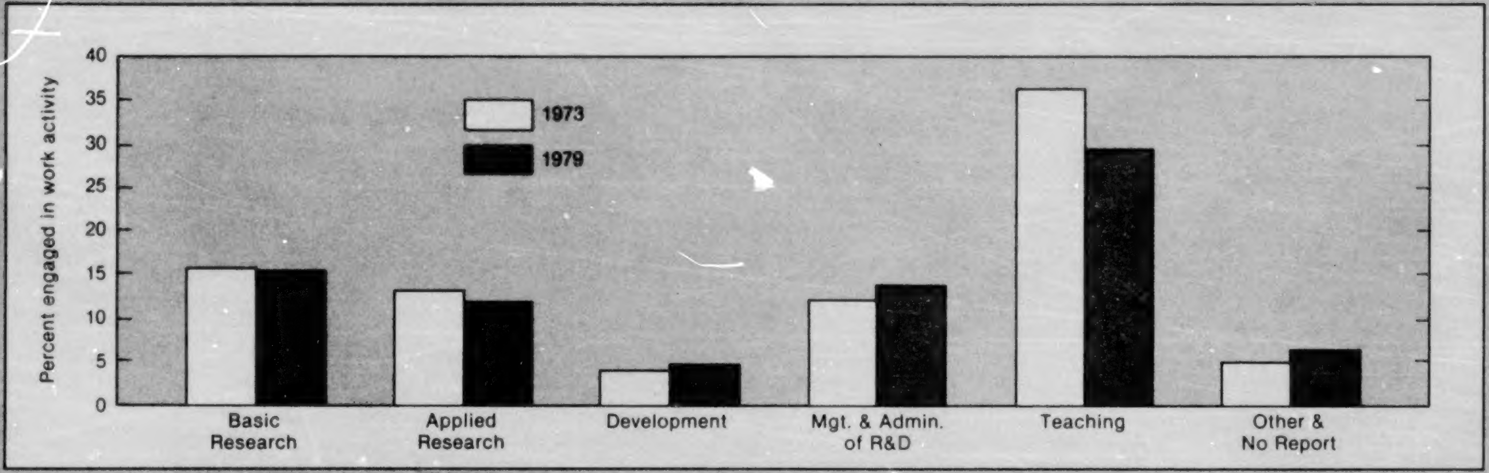
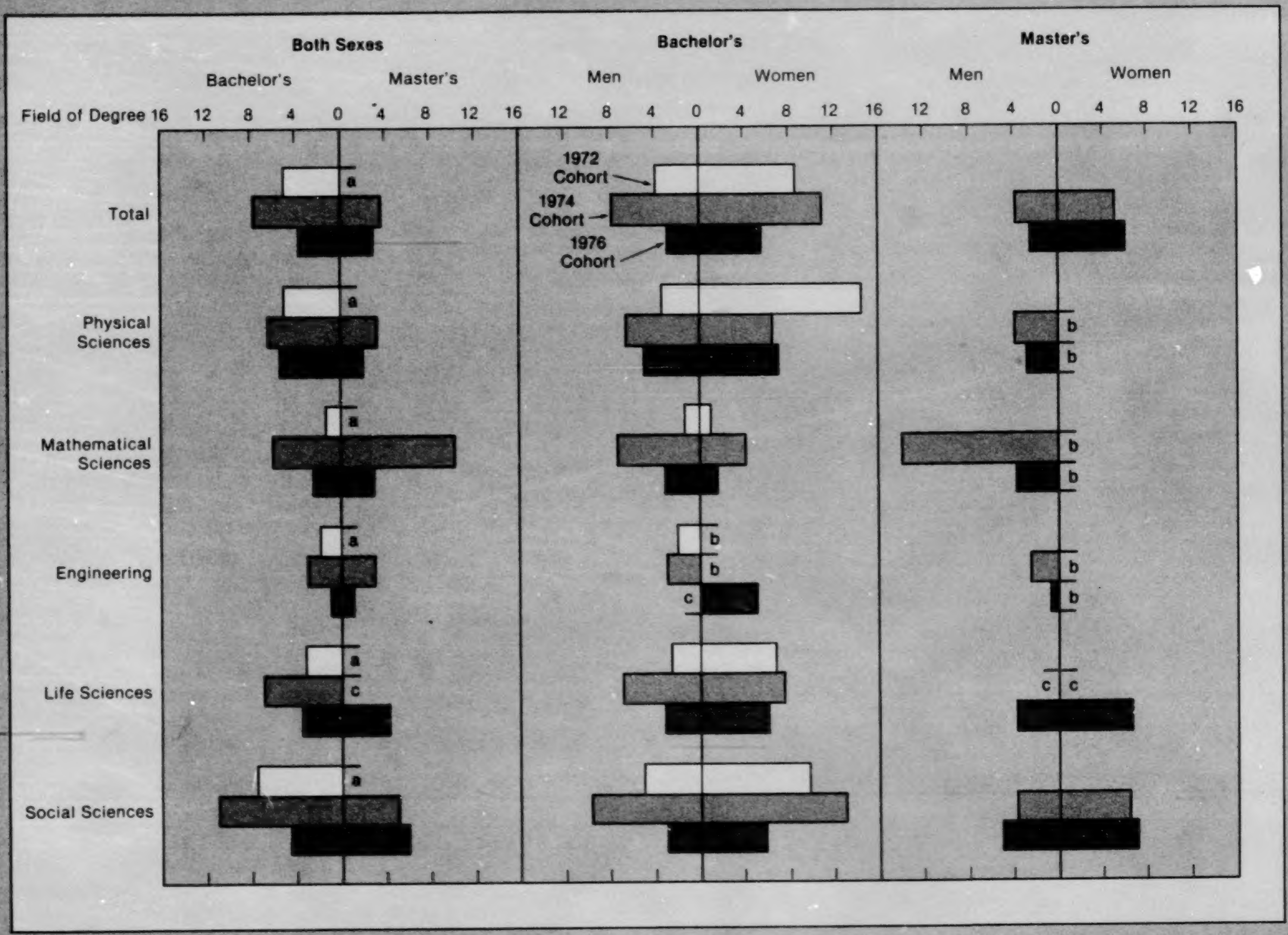


Table VI-2: Primary work of doctoral scientists and engineers, 1973, 1975, 1977 and 1979

Characteristics	1973		1975		1977		1979	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total Employed	220,410	100.0	256,045	100.0	284,312	100.0	313,736	100.0
Type of Employment								
Science/Engineering . . .	206,230	93.6	240,100	93.8	261,099	91.8	287,082	91.5
Other/Unknown Field . . .	14,180	6.4	15,945	6.2	23,213	8.2	26,654	8.5
Primary Work Activity								
Research & Development	71,460	32.4	82,360	32.2	93,477	32.9	99,701	31.8
Basic Research	34,258	15.5	38,144	14.9	43,549	15.3	47,864	15.3
Applied Research	28,700	13.0	32,885	12.8	36,426	12.8	36,842	11.7
Development	8,502	3.9	11,331	4.4	13,502	4.7	14,995	4.8
Mgt./Admin. of R&D . .	26,223	11.9	28,669	11.2	30,737	10.8	43,042	13.7
Teaching	80,012	36.3	91,159	35.6	90,413	31.8	91,922	29.3
Other Activities	6,959	3.2	7,482	2.9	12,785	4.5	15,679	5.0
No Report	3,688	1.7	6,078	2.4	5,824	2.0	4,163	[illegible]

Source: ***Characteristics of Doctoral Scientists and Engineers in the United States: 1979,*** **NSF 80-323, p. 3.**

Chart VI-3: Unemployment rates of science/engineering bachelor's- and master's- degree recipients by field of degree and sex: 2 years after graduation



[a] Data not available.

[b] No unemployment rate computed for groups with less than 1500 in labor force.

[c] Less than 0.5 percent.

Source: National Science Foundation, *Review of Data on Science Resources*, 1980, p. 9.

Table VI-3A: Selected employment characteristics of 1977 bachelor's degree recipients[1] in science and engineering by field and sex: 1979

Field of Study	Total			Labor Force			Total Employed			Employed in Science/Engineering			Employed in Field		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total	222,200	145,500	76,700	214,500	144,500	70,100	207,500	140,700	66,900	104,500	78,900	25,700	84,000	64,500	19,500
Physical Sciences	16,200	12,400	3,800	15,600	12,200	3,400	15,100	11,900	3,200	10,100	8,200	2,000	6,500	5,100	1,500
Chemistry	5,600	4,200	1,400	5,400	4,100	1,300	5,300	4,100	1,200	4,000	3,100	900	3,200	2,400	800
Physics/Astronomy	1,800	1,500	300	1,800	1,500	300	1,700	1,400	300	1,300	1,100	200	400	300	([2])
Environmental Sciences	7,800	5,900	1,900	7,500	5,900	1,600	7,200	5,700	1,500	4,300	3,500	800	2,800	2,200	600
Other Physical Sciences	1,000	700	300	1,000	700	300	900	700	200	500	400	100	200	100	([2])
Mathematical Sciences	18,000	11,100	6,900	17,900	11,100	6,800	17,800	11,000	6,800	12,200	7,500	4,700	10,800	6,500	4,300
Mathematics	12,300	6,800	5,500	12,100	6,800	5,300	12,000	6,700	5,300	7,000	3,700	3,300	5,900	3,000	3,000
Computer Sciences	5,800	4,300	1,500	5,800	4,300	1,500	5,800	4,300	1,500	5,100	3,800	1,400	4,900	3,500	1,400
Engineering	45,800	43,600	2,200	45,700	43,400	2,000	45,100	43,000	2,100	41,900	40,000	2,000	39,500	37,600	1,900
Life Sciences	52,300	33,000	19,300	50,800	32,800	18,000	49,200	31,900	17,300	25,600	16,100	9.500	18,200	11,300	6,900
Biology	34,700	19,500	15,200	33,600	19,300	14,300	32,300	18,600	13,700	14,800	7,400	7,400	8,900	4,000	4,900
Agricultural Sciences	17,600	13,500	4,100	17,200	13,500	3,700	16,900	13,300	3,600	10,800	8,700	2,100	9,300	7,300	2,000
Social Sciences	89,800	45,400	44,400	84,600	45,000	39,600	80,400	42,900	37,500	14,700	7,200	7,500	9,000	4,100	4,900
Psychology	36,300	15,000	21,200	32,800	15,000	17,800	31,000	14,500	16,500	6,500	2,700	3,800	4,000	1,600	2,400
Economics	10,900	8,600	2,300	10,600	8,600	2,000	9,900	8,100	1,900	2,500	1,800	700	1,500	700	700
Sociology/Anthropology	25,700	10,100	15,600	24,700	9,800	14,900	23,400	9,100	14,300	3,800	1,600	2,200	2,200	900	1,300
Other Social Sciences	17,000	11,700	5,300	16,500	11,500	4,900	16,100	11,300	4,800	7,900	1,100	800	1,300	900	400

[1] Excludes those enrolled full time in graduate school.

[2] Less than 50.

NOTE: Detail may not add to totals because of rounding. Statistics generated from these data may be slightly different from those presented in the text since the latter were based on absolute numbers.

Source: National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates*, 1980, p. 15.

Table VI-3B: Selected employment characteristics of 1977 master's-degree recipients[1] in science and engineering by field and sex: 1979

Field of Study	Total			Labor Force			Total Employed			Employed in Science/Engineering			Employed in Field		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total	45,300	35,300	10,000	44,300	35,100	9,200	43,400	34,500	8,800	33,000	27,700	5,300	33,600	27,800	5,800
Physical Sciences	4,400	3,500	900	4,200	3,400	800	4,200	3,400	800	3,700	3,100	600	2,400	2,000	400
Chemistry	1,300	900	400	1,200	900	400	1,200	900	300	1,200	800	300	900	700	200
Physics/Astronomy	700	600	100	700	600	100	700	600	100	700	600	100	300	300	([2])
Environmental Sciences	2,100	1,700	400	2,000	1,700	300	2,000	1,700	300	1,600	1,400	200	1,100	1,000	100
Other Physical Sciences	300	300	([2])	300	300	([2])	300	300	([2])	200	200	([2])	100	100	([2])
Mathematical Sciences	5,700	4,200	1,500	5,500	4,100	1,300	5,300	4,000	1,300	3,600	2,900	700	3,100	2,500	700
Mathematics	3,000	1,900	1,100	3,000	1,900	1,000	2,800	1,800	1,000	1,700	1,200	500	1,500	1,100	400
Computer Sciences	2,000	2,300	400	2,500	2,200	300	2,400	2,200	300	2,000	1,700	300	1,700	1,400	300
Engineering	14,900	14,200	700	14,800	14,100	700	14,700	14,000	700	14,100	13,500	600	12,900	12,400	500
Life Sciences	8,100	6,000	2,100	7,900	6,000	1,900	7,700	5,900	1,800	5,500	4,200	1,200	4,100	3,100	1,000
Biology	5,300	3,500	1,800	5,100	3,400	1,700	4,900	3,300	1,600	3,400	2,400	1,100	2,600	1,700	900
Agricultural Sciences	2,800	2,600	300	2,800	2,600	200	2,800	2,600	200	2,000	1,800	200	1,500	1,400	100
Social Sciences	12,300	7,400	4,900	11,900	7,400	4,500	11,500	7,200	4,200	6,200	4,100	2,200	5,100	3,200	2,000
Psychology	6,400	3,200	3,200	6,200	3,200	3,000	6,000	3,100	2,900	3,500	2,000	1,500	3,300	1,800	1,400
Economics	2,000	1,700	200	2,000	1,700	200	1,900	1,700	200	1,300	1,200	100	1,000	900	100
Sociology/Anthropology	2,000	1,000	1,000	1,800	1,000	900	1,700	900	800	900	500	500	700	300	300
Other Social Sciences	1,900	1,500	400	1,900	1,500	400	1,900	1,500	400	600	600	100	400	200	100

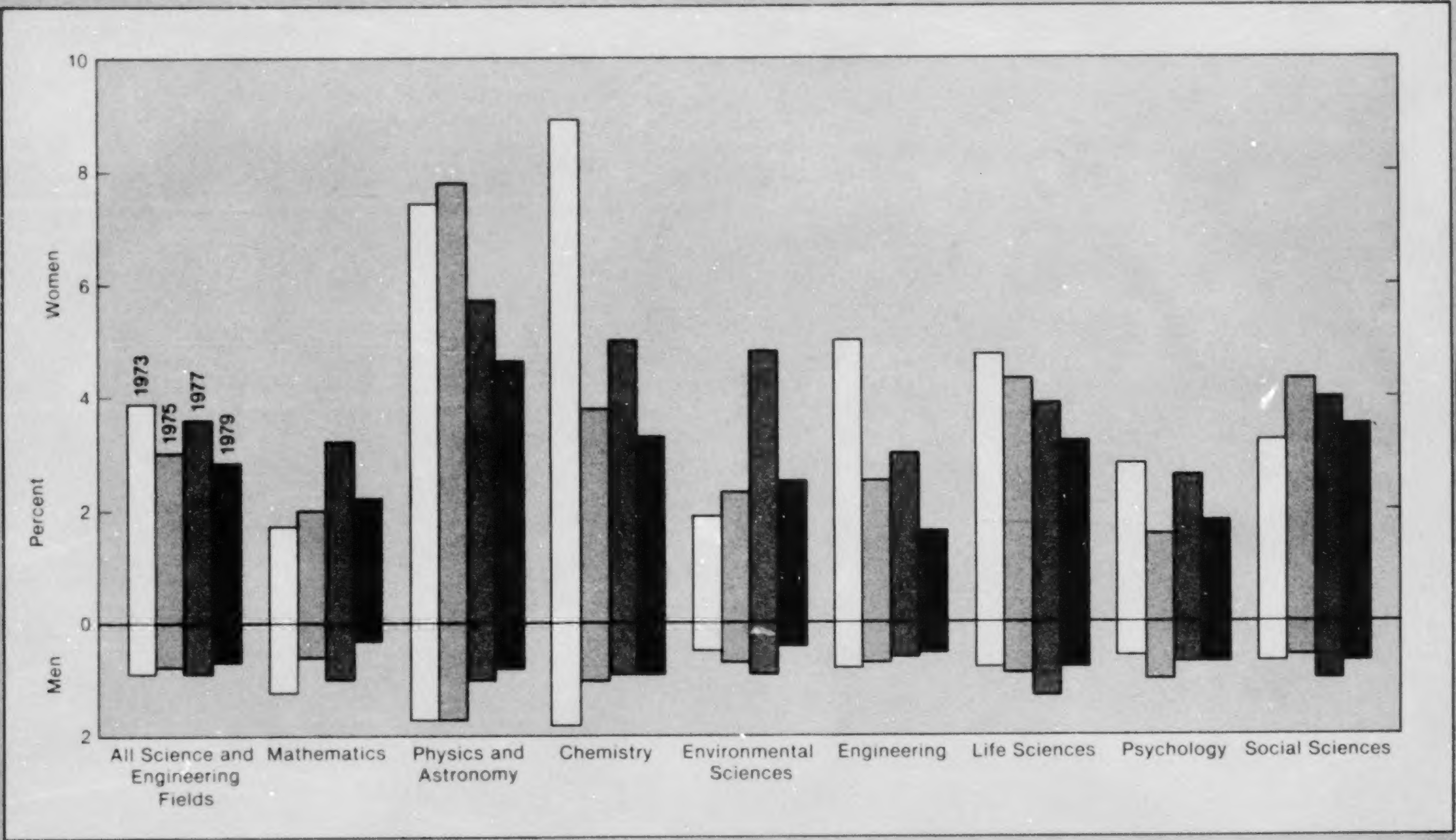
[1] Excludes those enrolled full time in graduate school.

[2] Less than 50.

NOTE: Detail may not add to total because of rounding. Statistics generated from these data may be slightly different from those presented in the text since the latter were based on absolute numbers.

Source: National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates*. NSF 80-325, p. 16.

Chart VI-4: Unemployment rates of doctoral scientists and engineers by field and sex, 1973, 1975, 1977, & 1979



Source: Vetter, Betty M., "Women Scientists and Engineers: Trends in Participation" *Science*, Dec. 18, 1981.

Table VI-4: Labor force and unemployment rates of doctoral scientists and engineers by field and sex, 1973, 1975, 1977 and 1979

	1973				1975				1977				1979			
	Men		Women		Men		Women		Men		Women		Men		Women	
	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate	Labor Force	Unempl. Rate
Total all Fields	211,345	0.9	18,046	3.9	241,805	0.8	23,139	3.0	252,940	0.9	27,262	3.6	275,900	.7	32,900	2.8
Math. Sciences	14,419	1.2	871	1.7	13,112	0.6	929	2.0	14,119	1.0	1,049	3.2	15,100	.3	1,200	2.2
Computer Sciences	2,826	0.0	88	0.6	3,515	0.0	143	0.0	1,401	0.0	102	0.0	1,700	.0	100	.0
Physics/Astronomy	16,925	1.7	418	7.4	19,108	1.7	511	7.8	24,709	1.0	646	5.7	26,100	.6	700	3.2
Chemistry	27,104	1.8	1,344	8.9	34,510	1.0	2,123	3.8	39,116	0.9	2,551	5.0	41,100	.9	2,700	3.3
Earth & Environ. Sci.	10,074	0.5	288	1.9	12,176	0.7	355	2.3	8,866	0.9	332	4.8	9,500	.4	500	2.5
Engineering	34,689	0.8	141	5.0	43,395	0.7	249	1.6	42,841	0.6	231	3.0	47,200	.5	400	2.5
Agricultural Sci.	11,055	0.6	149	14.1	13,531	0.3	179	6.1	12,663	0.5	261	2.7	13,500	.6	300	9.4
Medical Sciences	9,743	0.1	1,070	1.8	11,924	0.3	1,573	0.3	6,629	1.0	1,018	1.6	7,300	.8	1,300	2.2
Biological Sciences	32,774	0.8	5,167	4.7	34,494	0.9	6,123	4.3	41,791	1.3	7,742	3.9	46,100	.8	9,000	3.2
Psychology	20,008	0.6	4,853	2.8	23,999	0.5	6,561	1.6	25,093	0.9	7,543	2.6	28,400	.9	9,500	1.8
Social Sciences	23,742	0.7	2,703	3.2	31,948	0.6	3,360	4.3	35,712	1.0	5,807	4.0	39,900	.7	7,200	3.5

Source: Vetter, Betty M., Babco, Eleanor L., McIntire, Judith E., *Professional Women and Minorities: A Manpower Data Resource Service*, p. 56.
(Derived from: *Characteristics of Doctoral Scientists and Engineers in the United States, 1973, Detailed Statistical Tables*, National Science Foundation, (NSF 75-312A); *Characteristics of Doctoral Scientists and Engineers in the United States, 1975* (NSF 77-309) and *Science, Engineering & Humanities Doctorates in the United States, 1977 Profile*, National Research Council, 1978), and *Science, Engineering, and Humanities in the United States, 1979 Profile*, National Research Council, 1980.

Chart VI-5: Average underemployment of 1976-77 bachelor's degree recipients working full-time, by field and sex, February 1978

Except in psychology, men claim a greater degree of underemployment in science and engineering fields.

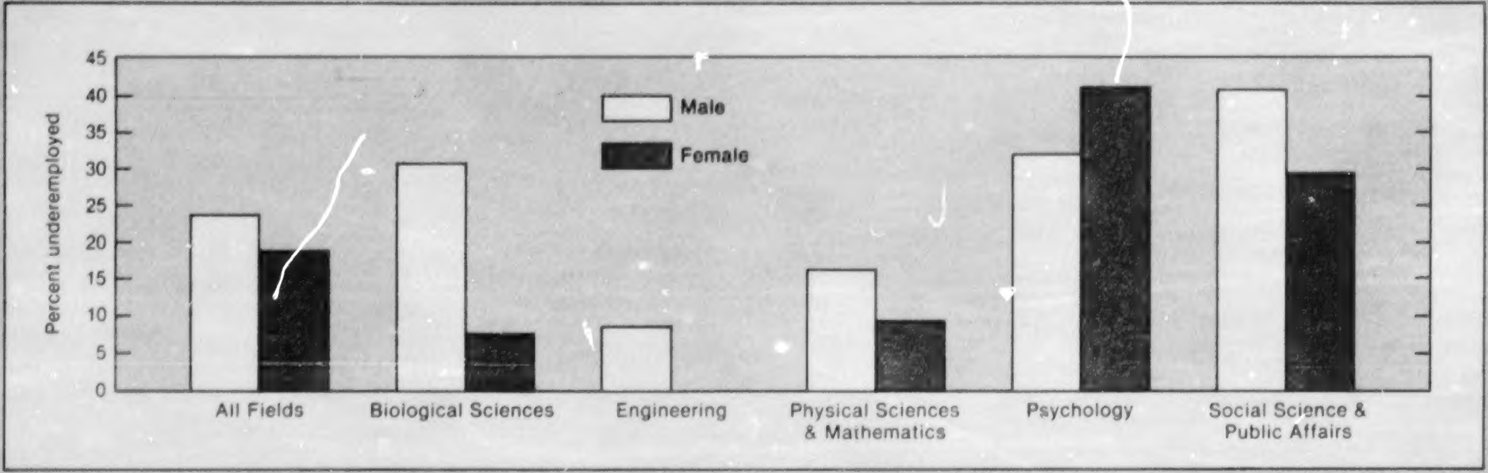


Table VI-5: Average underemployment[1] of 1976-77 bachelor's degree recipients working full-time, by major degree field and sex: February 1978

Major degree field	Percent Underemployed		
	Total	Male	Female
Total	21.6	23.7	19.0
Biological sciences	21.6	30.5	7.8
Engineering	7.9	8.4	0
Physical sciences & mathematics	14.1	16.0	9.4
Psychology	36.8	32.0	41.0
Social sciences & public affairs	36.3	40.4	29.5
Humanities	32.9	32.5	33.2
Business & management	18.6	19.9	14.2
Education	14.0	15.9	13.3
Health professions	2.5	3.4	2.3
Communications	23.0	19.7	26.3
Other	32.7	34.1	31.2

[1] Bachelor's degree recipients working full-time are defined as underemployed if in a job that is not professional, technical, managerial, or administrative and when asked, responded that job did not require a college degree. Definition includes additional stipulation that they are not enrolled in school.

Source: Dearman, Nancy B. and White, Valena Plisko, *The Condition of Education, 1979 Edition*, p. 242.

Chart VI-6: Percent of science and engineering doctorate recipients still seeking* position at time of Ph.D. by sex, 1965-77

It is becoming increasingly more difficult for new doctorate recipients to secure positions.

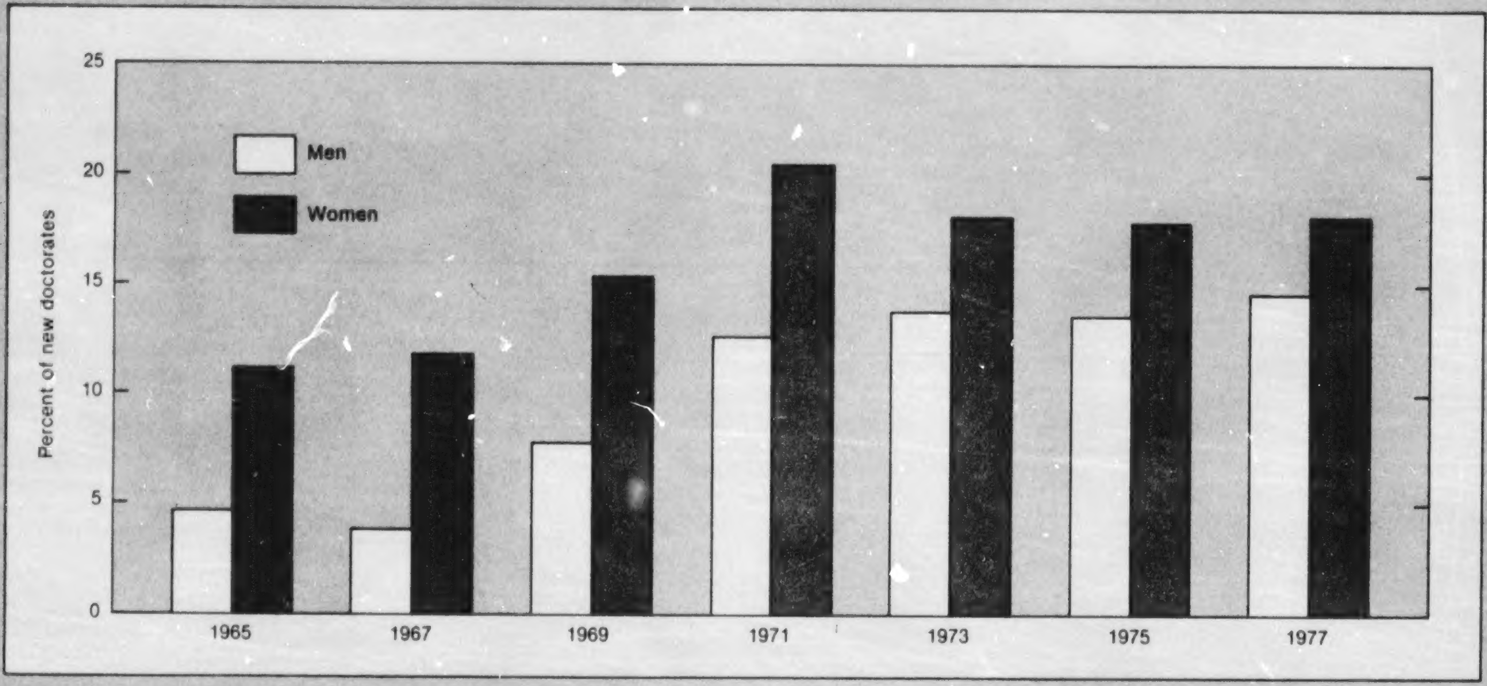


Table VI-6: Percent of science and engineering doctorate recipients still seeking* position at time of Ph.D. by sex, 1965-1977

	Male	Female
1965	4.7	11.1
1967	3.8	11.8
1969	7.8	15.3
1971	12.6	20.4
1973	13.8	18.2
1975	13.6	17.8
1977	14.6	18.2

*Still seeking position is defined as those who checked response 2 to item S on the Survey of Earned Doctorates questionnaire.

Source: NRC, Commission on Human Resources, National Research Council, unpublished data.

Chart VI-7: Median annual salaries of bachelor's and doctoral degree recipients: 1980

In all fields but engineering and mathematics, individuals with a doctoral degree and 2 to 5 years experience earned approximately twice as much as bachelor's degree recipients with no experience.

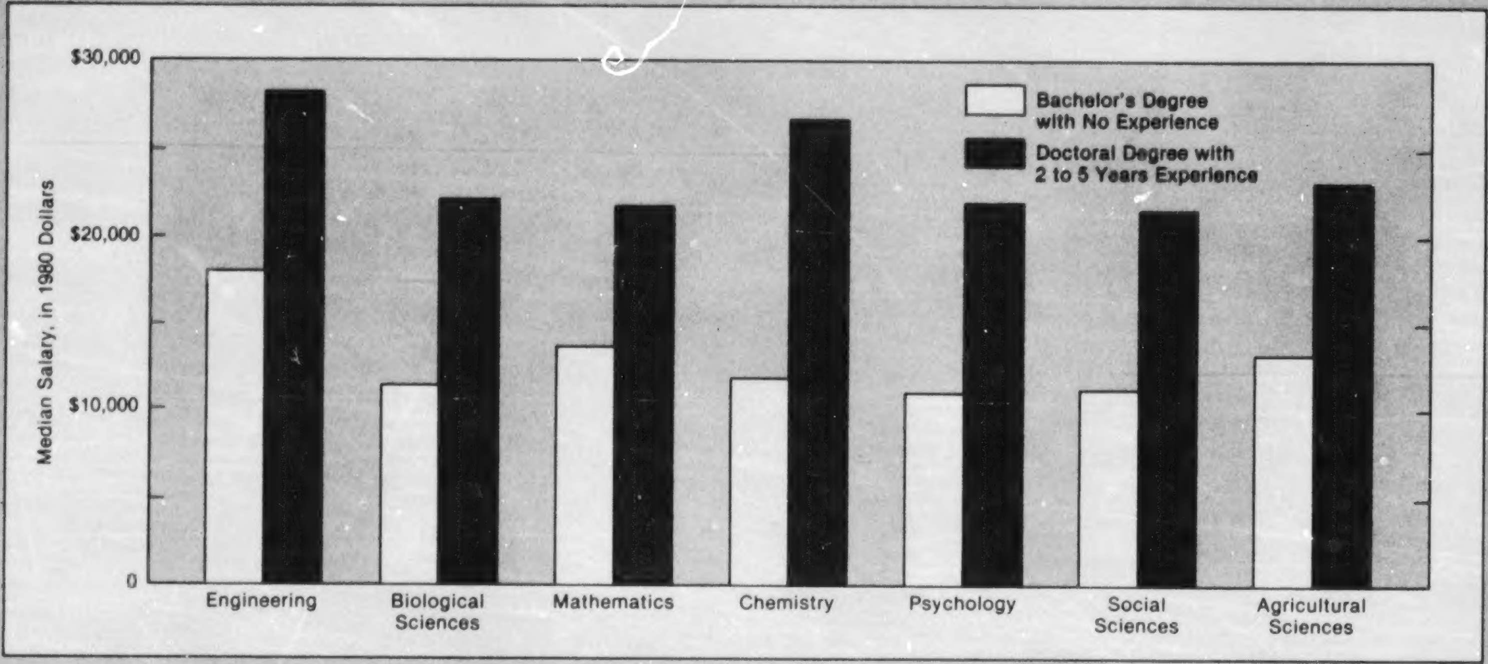


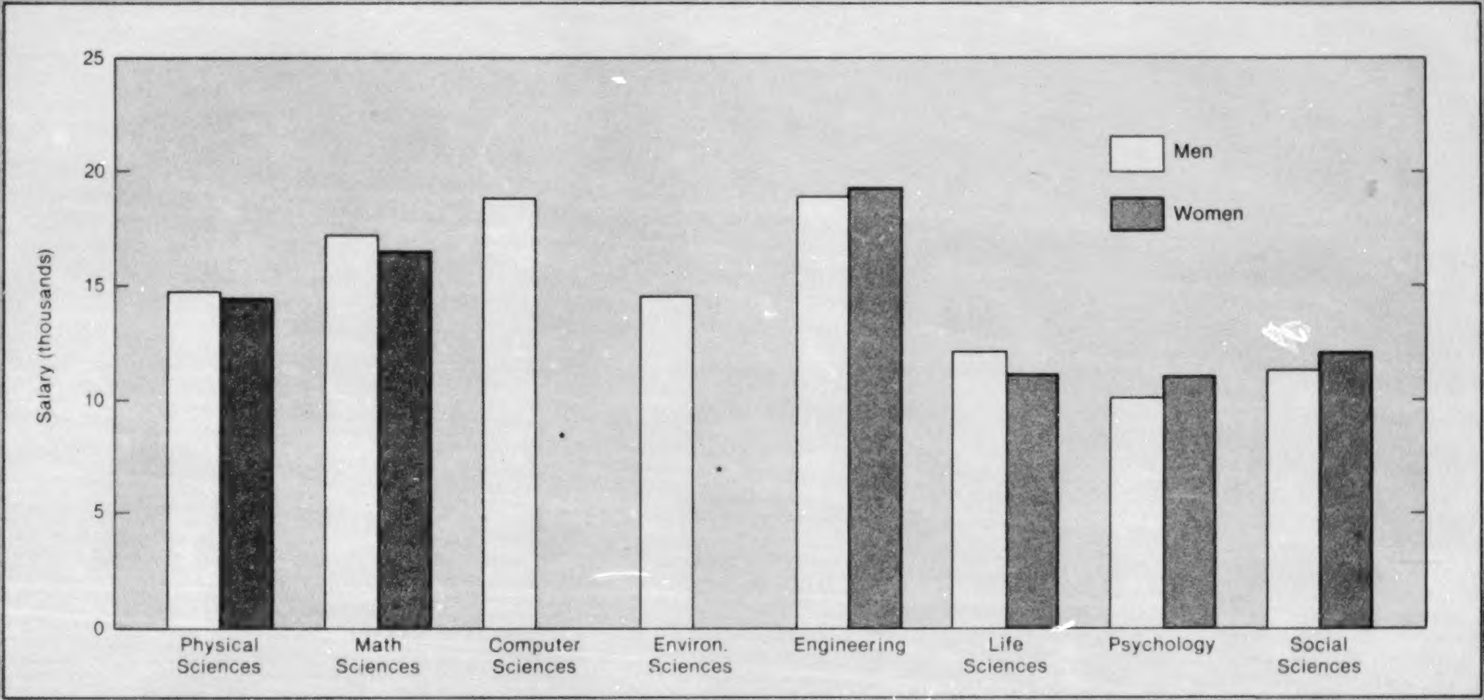
Table VI-7: Median annual salaries of bachelor's degree recipients with no experience and doctoral degree recipients with 2 to 5 years experience, by field of degree: 1980

	Median Salaries[1]	
	Bachelor's Degree No Experience	Doctoral Degree 2 to 5 Years Experience
Engineering	$17,933	$28,295
Biological Sciences	11,258	22,132
Mathematics	13,332	21,803
Chemistry	11,857	26,734
Psychology	11,043	22,023
Social Sciences	11,090	21,694
Agricultural Sciences	13,109	23,118

[1] Median salaries are for full-time workers only and have been adjusted to 1980 dollars using median earnings for professional, technical, and kindred workers.

Source: U.S. Department of Education, National Center for Education Statistics, Survey of Recent College Graduates, 1978, unpublished tabulations, and National Academy of Science, National Research Council, *Science, Engineering and Humanities Doctorates in the United States: 1979 Profile*, 1980.

Chart VI-8: 1979 Median annual salaries of 1977 baccalaureate recipients employed full-time in science or engineering, by field of study and sex



*No median computed for groups with less than 20 respondents.

Source: National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates*, 1980, p. 18.

Table VI-8: Median annual salaries of 1977 science/engineering baccalaureate recipients[1] by field of degree and S/E employment status: 1979

Field of Degree	Total Employed			Science/Engineering Employed			Non-Science Engineering Employed		
	Total	Men	Women	Total	Men	Women	Total	Men	Women
Total	14,100	15,300	11,500	16,300	17,100	13,200	12,100	13,100	10,500
Physical Sciences	14,200	14,300	13,600	14,700	14,700	14,500	12,100	12,200	10,200
Chemistry	14,100	14,200	13,700	14,500	14,500	14,500	11,600	12,100	(2)
Physics/Astronomy	15,100	15,100	(2)	15,500	15,400	(2)	(2)	(2)	(2)
Environmental Sciences	13,600	14,100	12,100	14,500	14,600	(2)	12,200	12,900	10,200
Other Physical Sciences	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Mathematical Sciences	16,000	16,300	15,100	17,100	17,200	16,500	11,300	12,100	10,700
Mathematics	14,600	15,000	14,400	16,400	16,800	16,200	11,100	11,600	10,700
Computer Sciences	18,100	18,600	(2)	18,600	18,900	(2)	(2)	(2)	(2)
Engineering	18,900	18,900	19,200	18,900	18,900	19,300	18,900	18,900	(2)
Life Sciences	12,000	12,200	11,200	12,000	12,100	11,100	12,100	12,500	11,600
Biology	11,600	12,100	11,400	11,200	11,400	11,100	12,100	12,200	11,700
Agricultural Sciences	12,200	12,800	10,200	12,400	12,900	10,600	12,200	12,600	9,100
Social Sciences	12,000	13,000	10,500	12,000	11,300	12,100	12,000	13,300	10,300
Psychology	11,600	12,200	11,100	10,400	10,100	11,100	12,000	13,200	11,000
Economics	15,000	15,300	(2)	(2)	(2)	(2)	14,800	15,100	(2)
Sociology/Anthropology	11,000	12,000	10,100	11,200	(2)	(2)	10,800	12,100	10,100
Other Social Sciences	12,900	13,000	11,200	(2)	(2)	(2)	13,000	13,400	9,400

[1] Excludes individuals enrolled full-time in graduate school.
[2] No median computed for groups with less than 20 respondents.
NOTE: Median annual salaries computed only for full-time employed civilians.
Source: National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates*, 1980, p. 18.

Chart VI-9: Average annual salaries of 1976-77 bachelor's-degree recipients working full-time, by field and sex, February 1978

Men outearn women in all fields except engineering, which is also the field providing the greatest salary.

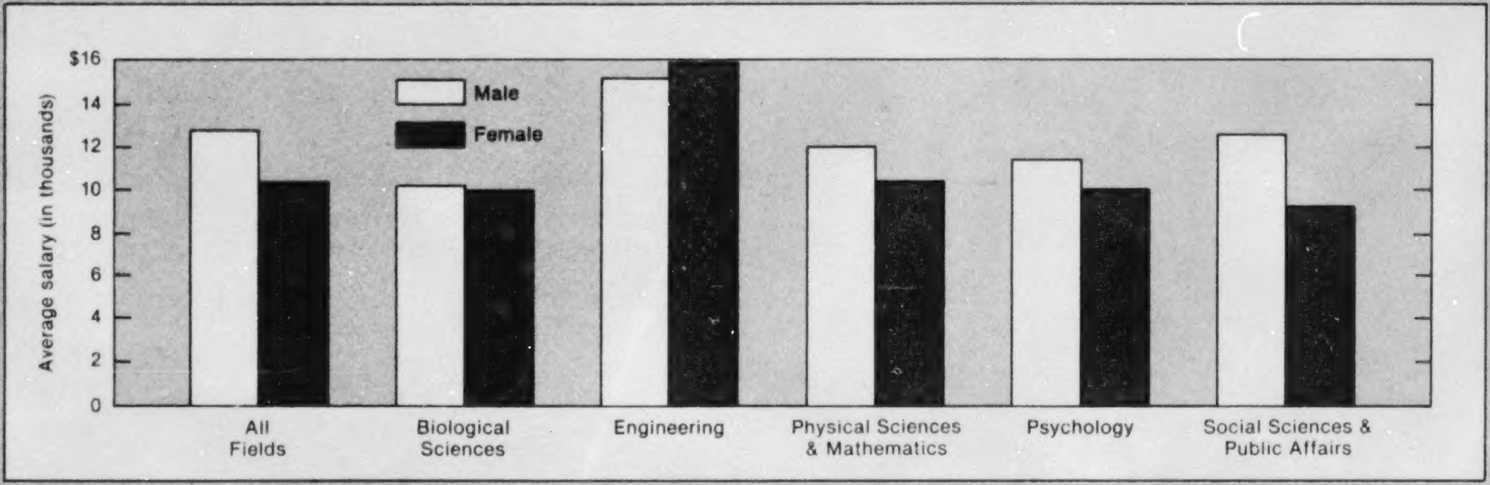


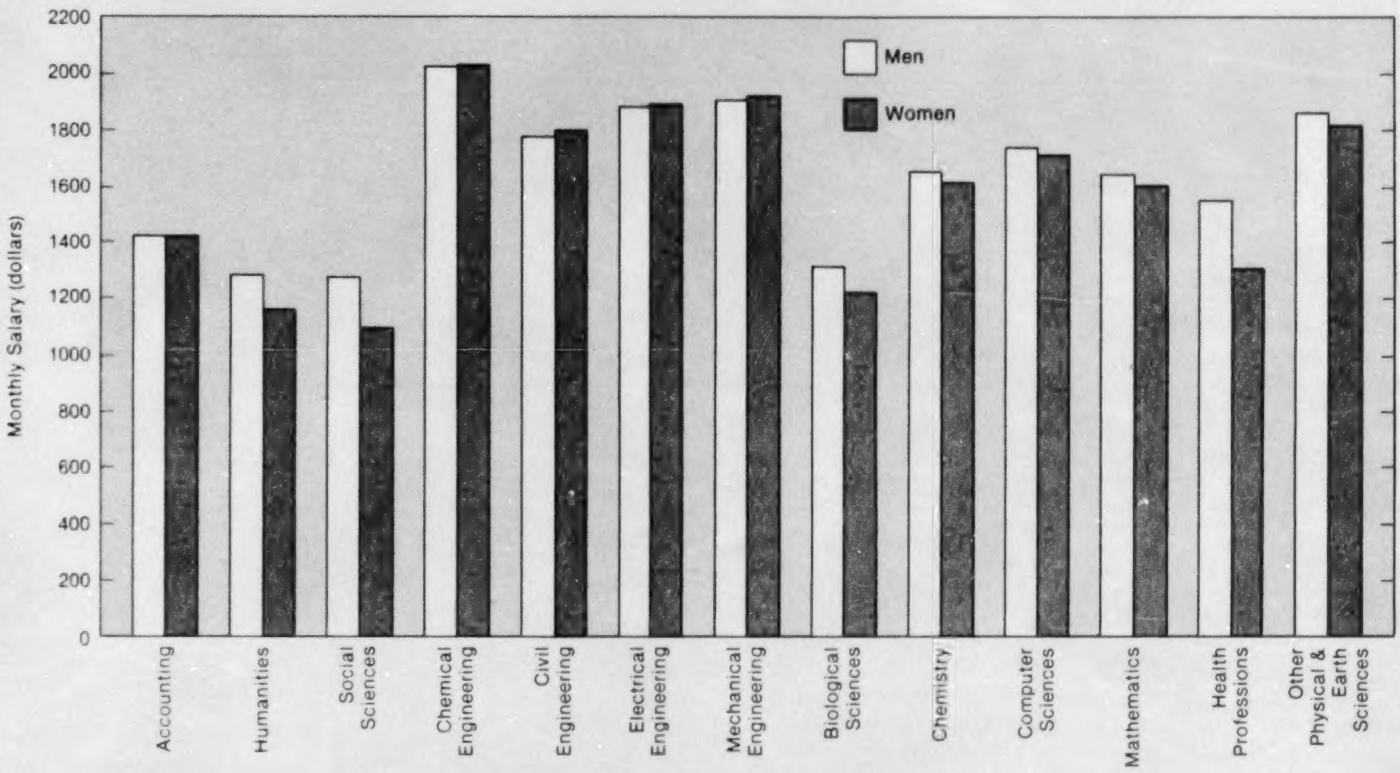
Table VI-9: Average annual[1] salaries of 1976-77 bachelor's degree recipients working full-time, by major degree field and sex: February 1978

Major degree field	Average salary Total	Male	Female
Total	$11,700	$12,700	$10,300
Biological sciences	10,100	10,200	10,000
Engineering	15,200	15,200	15,900
Physical sciences & mathematics	11,600	12,000	10,400
Psychology	10,700	11,400	10,000
Social sciences & public affairs	11,300	12,507	9,200
Humanities	9,500	10,300	8,800
Business & management	13,200	13,700	11,300
Education	11,100	11,700	10,800
Health professions	12,300	14,100	11,900
Communications	10,200	11,300	9,100
Other	10,500	11,900	8,800

[1] Salaries of teachers working on 9 to 10 month contracts have been adjusted to 12 month salaries.

Source: Dearman, Nancy and White, Valena Plisko, *The Condition of Education, 1979 Edition*, p. 242.

Chart VI-10: Beginning monthly salary offers to bachelor's degree candidates: July, 1981



Source: Scientific Manpower Commission, *Salaries of Scientists, Engineers, and Technicians*, p. 5.

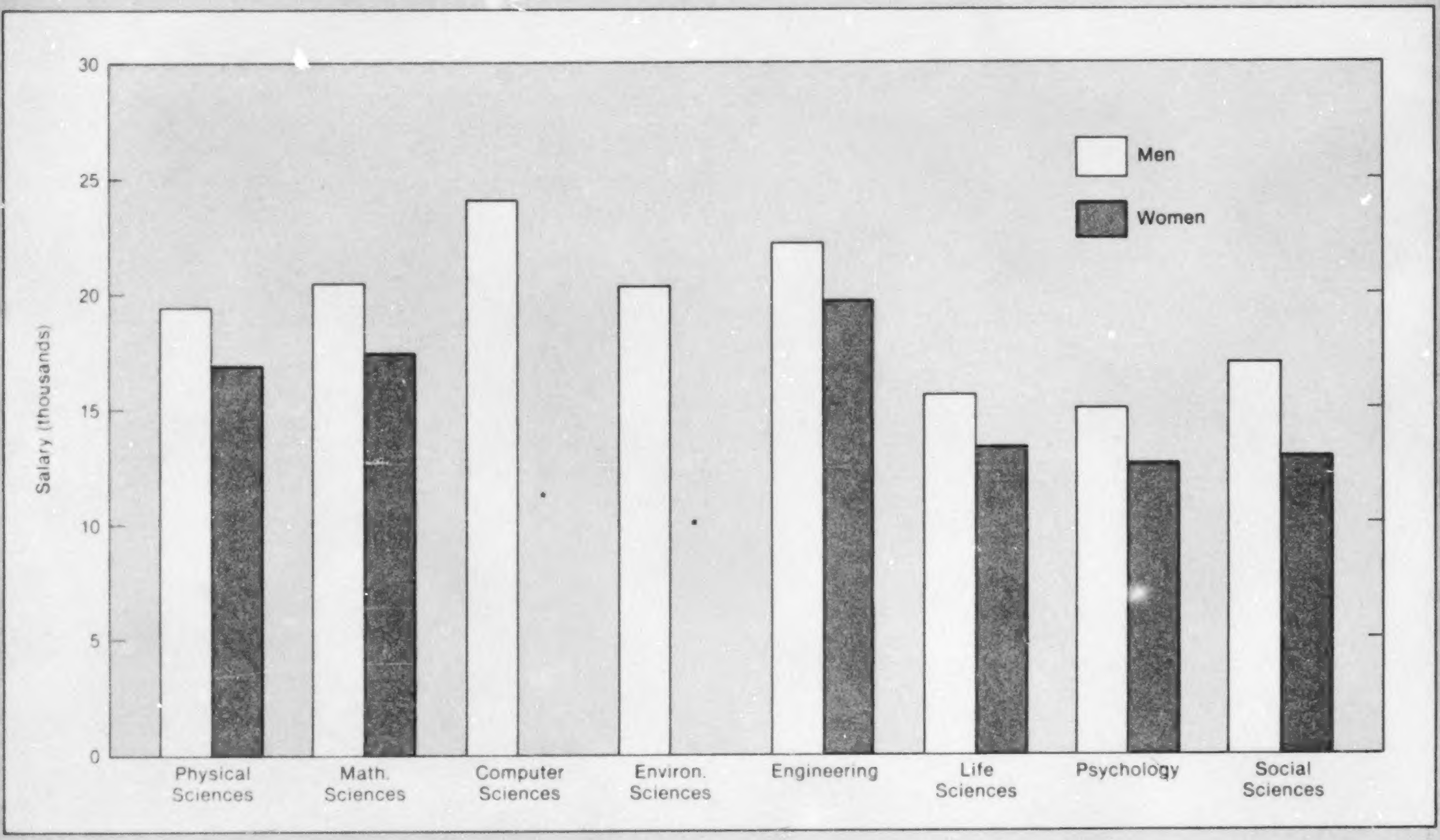
Table VI-10: Number and average starting monthly salary offers to bachelor's degree candidates by curriculum and sex, July 1980 and July 1981

Curriculum	No. Offers July 1980		Average $ Offers July 1980		No. Offers July 1981		Average $ Offers July 1981	
	Men	Women	Men	Women	Men	Women	Men	Women
Business								
Accounting	5,636	2,945	$1,293	$1,292	4,945	2,949	$1,418	$1,418
Business — General (Inc. Management)	3,327	1,478	1,232	1,187	2,979	1,397	1,375	1,315
Marketing and Distribution	1,260	786	1,168	1,108	1,003	738	1,293	1,227
Engineering								
Aeroanuatical	559	32	1,650	1,621	646	51	1,812	1,840
Chemical	5,439	1,590	1,800	1,804	5,734	1,694	2,031	2,027
Civil[1]	3,645	536	1,549	1,584	3,755	661	1,771	1,796
Electrical[2]	10,160	960	1,690	1,688	9,694	1,074	1,822	1,886
Industrial	1,819	475	1,648	1,683	1,401	514	1,839	1,859
Mechanical	9,638	999	1,700	1,726	9,421	1,252	1,907	1,911
Metallurgical[3]	693	187	1,731	1,707	698	190	1,913	1,921
Mining	170	5	1,736	1,687	253	32	1,942	1,929
Nuclear (inc. Engineering Physics)	321	30	1,666	1,692	292	57	1,866	1,890
Petroleum	687	75	1,986	1,994	1,271	174	2,224	2,206
Technology	1,727	99	1,587	1,540	1,644	124	1,809	1,792
Humanities and Social Sciences								
Humanities	236	345	1,121	1,042	268	407	1,275	1,157
Economics[4]	354	232	1,265	1,232	403	235	1,389	1,336
Other Social Sciences	472	725	1,162	1,013	389	602	1,270	1,099
Sciences								
Agricultural	447	104	1,221	1,069	402	88	1,304	1,206
Biological	132	90	1,210	1,084	108	107	1,315	1,222
Chemistry	249	178	1,477	1,434	253	156	1,653	1,612
Computer	1,637	932	1,567	1,543	1,830	1,046	1,736	1,709
Health (Medical) Professions	49	251	1,233	1,139	68	398	1,557	1,305
Mathematics	404	419	1,493	1,457	380	349	1,641	1,607
Other Physical and Earth Sciences	307	46	1,576	1,324	558	145	1,854	1,813

[1] Includes Construction, Sanitary & Transportation Engineering.
[2] Includes Computer Engineering.
[3] Includes Metallurgy and Engineering Ceramics.

Source: The College Placement Council, *CPC Salary Survey — A Study of 1980-81 Beginning Offers, Formal Report*, No. 3, July 1981. Scientific Manpower Commission, *Salaries of Scientists, Engineers, and Technicians*, p. 5.

Chart VI-11: 1979 Median annual salaries of 1977 master's graduates employed full-time in science and engineering by field of study and sex



*No median computed for groups with less than 20 respondents.

Source: National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates, 1980*, p. 19.

Table VI-11: Median annual salaries of 1977 science/engineering masters-degree recipients[1] by field of study and S/E employment status: 1979

Field of Study	Total Employed			Science/Engineering Employed			Non-Science Engineering Employed		
	Total	Men	Women	Total	Men	Women	Total	Men	Wom
Total	18,900	19,500	14,900	19,400	20,100	15,300	15,000	16,100	14,2
Physical Sciences	19,000	19,300	16,200	19,300	19,500	16,800	16,100	16,900	
Chemistry	18,900	19,500	(2)	19,100	19,600	(2)	(2)	(2)	
Physics/Astronomy	19,100	19,400	(2)	19,200	19,200	(2)	(2)	(2)	
Environmental Sciences	19,100	19,300	16,400	19,900	20,300	(2)	(2)	(2)	
Other Physical Sciences	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	
Mathematical Sciences	19,300	20,200	16,900	20,300	20,400	17,400	16,000	16,100	
Mathematics	16,900	18,100	16,200	18,600	19,200	(2)	14,300	14,800	
Computer Sciences	24,200	24,200	(2)	24,100	24,100	(2)	(2)	(2)	
Engineering	22,300	22,300	20,300	22,200	22,200	19,800	(2)	(2)	
Life Sciences	14,800	14,900	13,300	15,200	15,500	13,300	13,300	13,300	
Biology	14,800	15,000	13,400	15,500	16,200	13,600	12,200	12,200	
Agricultural Sciences	14,800	14,800	(2)	14,900	15,000	(2)	14,400	14,400	
Social Sciences	16,000	17,200	13,600	16,200	17,000	13,000	15,100	16,500	14,3
Psychology	14,400	15,200	13,500	14,100	15,000	12,600	14,900	16,200	14,4
Economics	18,800	18,900	(2)	19,100	19,100	(2)	(2)	(2)	
Sociology/ Anthropology	16,000	18,000	(2)	(2)	(2)	(2)	13,600	(2)	
Other Social Sciences	17,300	17,500	(2)	(2)	(2)	(2)	17,400	(2)	

[1] Excludes individuals enrolled full-time in graduate school.

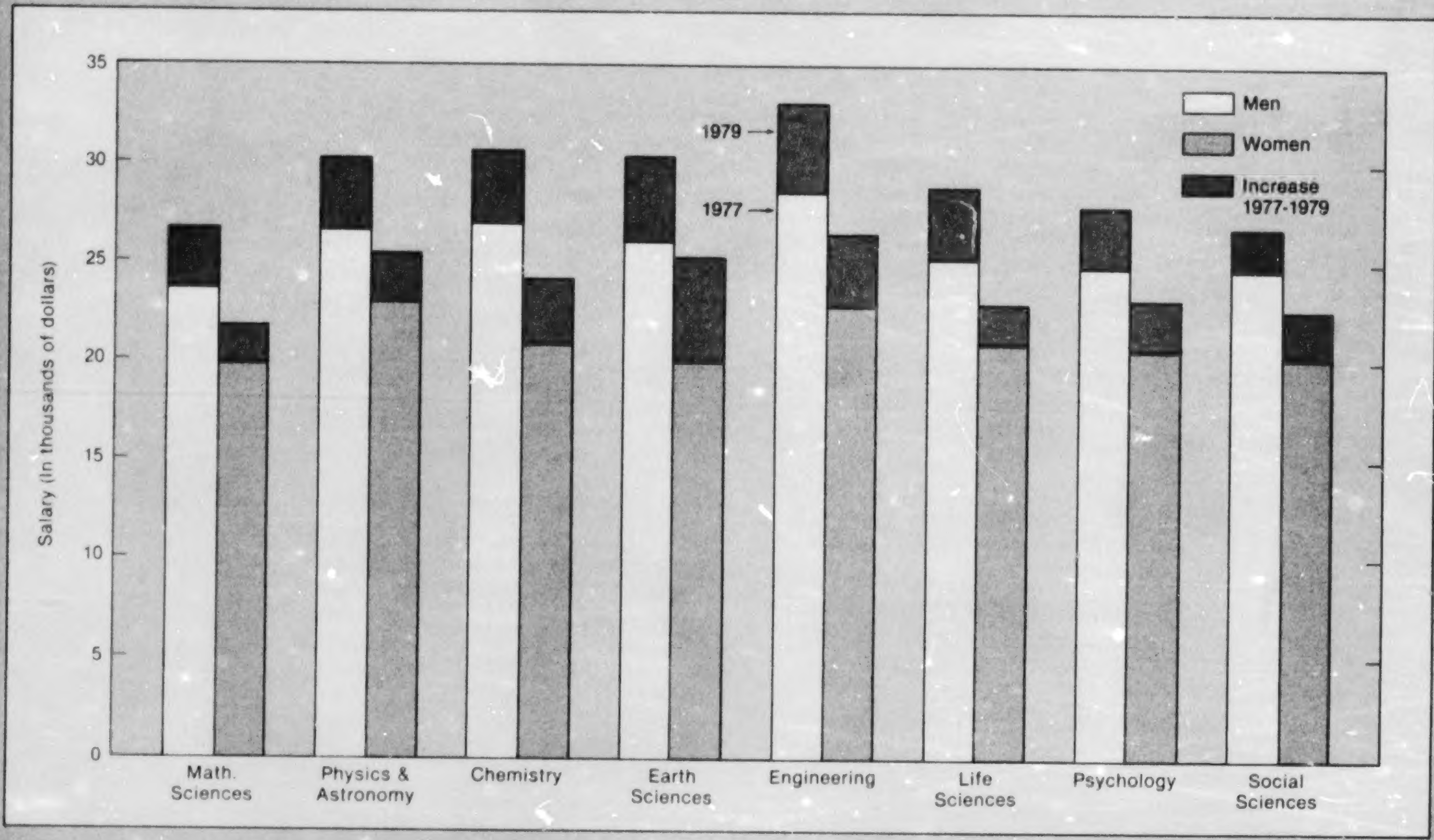
[2] No median computed for groups with less than 20 respondents.

NOTE: Median annual salaries computed only for full-time employed civilians.

Source: National Science Foundation, *Employment Attributes of Recent Science and Engineering Graduates*, p. 19.

Chart VI-12: Median annual salaries of doctoral scientists and engineers, by field and sex: 1977 and 1979

At the doctoral level, men outearn women in every discipline.



Source: *Characteristics of Doctoral Scientists & Engineers in the U.S. — 1979*, NSF 80-323, p. 44.

Table VI-12: Median annual salaries of doctoral scientists and engineers, by field and sex: 1977 and 1979

Field	1977			1979		
		Sex			Sex	
	Total	Men	Women	Total	Men	Women
All fields	$25,600	$26,000	$20,700	$29,100	$29,900	$23,100
Physical Scientistis	26,600	26,800	21,200	30,300	30,500	24,400
Chemists	26,600	27,000	20,900	30,400	30,700	24,200
Physicists & Astronomers	26,500	26,500	23,100	30,100	30,200	25,400
Mathematical Scientists	23,300	23,600	19,900	26,300	26,700	21,700
Mathematicians	23,100	23,400	19,900	26,100	26,400	21,800
Statisticians	25,100	25,400	19,80	29,300	29,600	21,600
Computer Specialists	25,800	26,100	20,800	28,500	28,800	22,800
Environmental Scientists	25,800	26,000	19,70	30,300	30,400	23,500
Earth Scientists	25,900	26,000	20,000	30,300	30,400	25,300
Oceanographers	24,100	24,400	19,200	28,800	30,100	21,500
Atmospheric Scientists	28,300	28,900	19,200	31,300	31,800	—
Engineers	28,600	28,700	22,900	33,100	33,200	26,600
Life Scientists	24,700	25,100	21,000	28,100	28,900	23,000
Biological Scientists	23,800	24,300	20,500	26,400	27,500	22,200
Agricultural Scientists	24,800	24,900	20,200	29,000	29,100	21,600
Medical Scientists	28,000	28,900	22,800	30,900	32,700	25,300
Psychologists	24,100	24,900	20,600	26,700	28,000	23,200
Social Scientists	24,100	24,700	20,200	26,200	26,800	22,600
Economists	27,000	27,500	23,600	31,000	31,500	26,900
Sociologists/Anthropoligists	22,200	22,900	19,700	23,900	25,000	22,100
Other Social Scientists	23,200	23,900	19,800	25,300	25,700	22,300

NOTE: All median salaries were computed only for full-time employed civilians. No median was computed for groups with fewer than 20 individuals reporting salary.
Source: National Science Foundation, *Characteristics of Doctoral Scientists and Engineers in the United States: 1977, Technical Notes and Detailed Statistical Tables*, p. 50. Also *Characteristics of Doctoral Scientists and Engineers in the United States: 1979*, p. 44.

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National Report, College-Bound Seniors for the years 1973 through 1979 summarizes the College Board ATP records of high school seniors who registered for Scholastic Aptitude Tests (SAT) or Achievement Tests at any time during their high school years. The 1979 report presents data for about one million seniors, about a third of all seniors of 1979 and about two-thirds of all who go directly to college. Included are summaries of scores for the SAT, and the Achievement Tests, and from the Student Descriptive Questionnaire (SDQ) data on high school records of students, their socioeconomic characteristics, and their college plans. Results of the Test of Standard Written English (TSWE) are included from 1974-75 onwards. Copyright © 1977, 1978, 1979 by College Entrance Examination Board, New York.

Atelsek, Frank J. and Gomberg, Irene L. *Young doctoral faculty in science and engineering: Trends in composition and research activity.* (Higher Education Panel Report, Number 43) Washington, D.C.: American Council on Education, February 1979.

Young Doctoral Faculty in Science and Engineering: Trends in Composition and Research Activity is the report of a survey funded by the National Science Foundation, the U.S. Office of Education, and the National Institute of Education to ascertain the extent of declines in the proportion of young doctorates in science and engineering faculties. The report discusses expected faculty hiring during 1978-79, comparisons with earlier surveys, trends in faculty composition, and measures of research activities of younger and older faculty members.

Carnegie Foundation for the Advancement of Teaching. *Missions of the college curriculum.* San Francisco: Jossey-Bass, 1977.

Missions of the College Curriculum seeks to describe for persons involved with curriculum, particularly those new to the responsibilities therein, the current state of American curricula in institutions of higher education and ways of change and development. The preface observes that the timing of the study is such because higher education has undergone considerable change in the past decade, that change is continuing, and that the period ahead is one of no growth for higher education but important social changes for society. Fourteen chapters and four appendices comprise the volume.

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ASTC Science Museum Funding Study represents a preliminary, unverified by agencies, draft-form report of the structure of lead agency support for science museums from federal sources. The data were gathered from agency annual reports, program office reports, and individual museum reports of federal funding. Since it provides preliminary estimates, it can only give rough estimates until more precise data are made available.

College Placement Council Inc. *CPC salary survey: A study of 1978-79 beginning offers, final report,* July 1979. Bethlehem, PA: 1979.

The **CPC Salary Survey** presents data on beginning monthly salary offers made to graduates at all degree levels from a representative group of colleges and universities in the United States. A broad number of job types is surveyed, although teaching is excluded. The College Placement Council issues reports five times annually to members and subscribers. This report contains 2 pages of text analysis and 9 pages of tables and charts covering offers by sex, field, type of employer, and level of degree.

Dearman, Nancy B. and White, Valena Plisko, *The condition of education, 1979 edition,* (National Center for Education Statistics, Statistical Report, Stock No. 017-080-02008-4). Washington, D.C.: U.S. Government Printing Office, 1979.

The Condition of Education, 1979 Edition, is the fifth annual report in a series describing various conditions in education as well as in the larger society affecting education. The first of its two parts provides an overview of education in three sections: the social context of education (the family, work and the community); elementary and secondary education (enrollments, school environment, *etc.*); postsecondary education (enrollments in higher and adult education, faculties, finances, *etc.*). The second part of the volume deals with three selected topics: financing precollege public education; outcomes of education; and the status of women and minorities in higher education. There is an appendix, and a cumulative index. The format of the text is a discussion of the section followed by numerous tables each accompanied by an illustrative chart.

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Engineering Manpower Bulletins provide information on trends and developments in manpower for engineering and related technologies. Number 47 summarizes a two-part report, *Engineering and Technology Enrollments Fall 1978*, presenting four tables, one figure and interpretive text on current and past engineering enrollments.

Frankel, Martin M. *Projections of education statistics to 1986-87*, (National Center for Education Statistics, Stock No. 017-080-01918-3). Washington, D.C.: U.S. Government Printing Office, 1978.

Projections of Education Statistics to 1986-87 provides projections of statistics for elementary schools, secondary schools, and institutions of higher education. The projections which are revised annually based upon newly collected data by NCES include statistics on enrollments, graduates, teachers, and expenditures. The latest population projects and estimates from the Bureau of the Census are also incorporated in the volume on a yearly basis.

Golladay, Mary A. and Noell, Jay. *The condition of education, 1978 edition*, (National Center for Education Statistics, Statistical Report, Stock No. 017-080-01822-5). Washington, D.C.: U.S. Government Printing Office, 1978.

The Condition of Education, 1978 Edition is an annual statistical report describing various conditions in education as well as in the larger society affecting education. This volume, which is the fourth report to be published in this series, is organized into two parts. The first part is concerned with trends and developments at all levels of education including the societal context for describing education (e.g., public opinion, school age population, financial support); elementary and secondary education (e.g., public and professional opinion, enrollments, outcomes); and post secondary education (e.g., enrollment in higher education, characteristics of institutions, and adult education). The second part looks at educational personnel, the financing of higher education, and a comparison of education and labor force participation patterns in the United States and other selected nations. The format of the volume is a discussion of a topic followed by numerous tables and charts in which each table is illustrated on the following page by a chart (i.e., a statistical graph).

Gooler, Dennis D. The development and use of educational indicators. *Educational indicators: Monitoring the state of education.* (Proceedings of the 1975 ETS Invitational Conference) Princeton: Educational Testing Service, 1976.

The Development and Use of Educational Indicators suggested the main features of the organizing framework for this Databook. Gooler categorizes educational indicators as follows: access, aspirations, achievement, impact, and resources. He notes that the information base for access and resources is reasonably good, adequate for achievement, and poor for aspirations and impact.

Grant, W. Vance and Lind, C. George. *Digest of education statistics 1977-78* and *1979*, (National Center for Education Statistics). Washington, D.C.: U.S. Government Printing Office, 1978, 1979.

Digest of Education Statistics, 1977-78, and 1979 continue a series published annually since 1962. They provide an abstract of statistical information covering American education from kindergarten through graduate school. The Digest includes data on the number of schools and colleges, enrollments, teachers, graduates, attainments, finances, federal funds for education, libraries, international education, and research and development. The 1977-78 edition, also contains a number of innovations from previous editions, such as NAEP data on social and political attitudes of 13- and 17-year-olds, years for computing school attendance in each state, trends on Scholastic Aptitude Test scores, college dropouts for the high school class of 1972, expenditures for school lunch programs, and expenditures for public libraries. The 1979 edition's innovations include data on trends in engineering enrollments and on earned degrees conferred in mathematics, biological sciences and physical sciences.

Hamblen, John W. and Baird, Thomas B., (Eds.). *Fourth inventory of computers in higher education*. Princeton: Edcom, 1979.

Fourth Inventory of Computers in Higher Education reports data from the fourth national survey of computers in higher education. The book consists primarily of tables on computers: numbers of, expenditures, degree programs, instructional and administrative use, student access, and other topics. An interpretive report is due to be published in early 1980.

Klus, John P. and Jones, Judy A. *Survey of continuing education activities for engineers and scientists.* Washington, D.C.: The American Society for Engineering Education, 1978.

Survey of Continuing Education Activities for Engineers and Scientists summarizes the findings of a poll of 349 universities and professional/technical associations concerning their activities in continuing education. Included in the summary are statistics related to noncredit activities, such as, intensive short courses; non-credit after-hours courses; institutes, seminars, etc.; correspondence courses; and self study activities. Also discussed are degree credit courses and the development and operation of courses with attention to such factors as needs analyses, promotion, evaluations, and funding.

Malitz, Gerald S. *Associate degrees and other formal awards below the baccalaureate: Analysis of 6-year trends* (National Center for Education Statistics, Stock No. 017-080-01848-9). Washington, D.C.: U.S. Government Printing Office, 1978.

Associate Degrees and Other Formal Awards Below the Baccalaureate: Analysis of 6-Year Trends is based upon a survey which is part of the Higher Education General Information Survey (HEGIS) conducted annually by NCES. This report which focuses upon the years 1970-71 through 1975-76 compares data available on curriculum categories and divisions, types of instructional units, and classifications of degrees and awards. Included are associate degrees and all other formal awards which require at least two but less than four years of post secondary work, regardless of whether or not the work was intended to be applicable toward a baccalaureate degree.

National Assessment of Educational Progress. *Changes in social studies performance, 1972-76.* (National Center for Education Statistics, Report No. 07-SS-01). Denver, Colorado: 1978.

Changes in Social Studies Performance, 1972-76 studies the changes in two surveys conducted by NAEP to measure achievement in social studies during the 1971-72 school year and during the 1975-76 school year. These surveys provided data on changes in social studies achievement for young Americans aged 9, 13, and 17. Changes were reported in knowledge, skills, and attitudes, related to economics, geography, history, and politics. The publication includes sample items from the surveys as well as the statistics (charts, graphs, etc.) related to the changes.

National Assessment of Educational Progress. *Attitudes toward science: A summary of results from the 1976-77 national assessment of science.* (National Institute of Education, Report No. 08-S-02) Denver, Colorado: 1979.

Attitudes toward Science presents findings from the 1976-77 assessment of science that indicate how students ages 9, 13, and 17, and in some cases young adults (ages 26-35), responded to questions on three major topics: 1) personal experience with science, 2) science and society, and 3) awareness of the philosophy and methodology of science. The data are analyzed by age, racial, geographic, and other categories.

National Assessment of Educational Progress. *Changes in mathematical achievement, 1973-78.* (National Institute of Education, Report No. 09-MA-01) Denver, Colorado: 1979.

Changes in Mathematical Achievement, 1973-78, relates the changes in two surveys conducted by NAEP to measure achievement in mathematics during the school years of 1972-73 and 1977-78. The subjects of the surveys were 9-, 13-and 17-year-olds. The 1977-78 assessment dealt with four cognitive process levels (knowledge, skills, understanding, and application) across a variety of traditional mathematics content areas (numbers and numeration, variables and relationships, geometry, measurement, and other topics such as graphs, and probability). The publication includes sample items from the surveys as well as the statistics (tables, charts, etc.) related to the changes.

National Assessment of Educational Progress. *Energy knowledge and attitudes: A national assessment of energy awareness among young adults.* (National Center for Education Statistics, Report No. 08-E-01) Denver, Colorado: 1978.

Energy Knowledge and Attitudes: A National Assessment of Energy Awareness Among Young Adults is a report of a survey administered to a sample of American adults during the summer of 1977. Seventy knowledge questions and 76 attitudinal questions were given in this assessment. The questions measuring knowledge fell into three major categories: (1) basic energy facts, (2) general energy issues, and (3) energy conservation. The attitude questions were categorized into four major classifications: (1) feelings about the seriousness of energy problems, (2) belief in the effectiveness of personal action, (3) feelings toward environmental hazards, and (4) feelings toward energy trade-offs.

National Assessment of Educational Progress. *Mathematical knowledge and skills.* (National Institute of Education, Report No. 09-MA-02) Denver, Colorado: 1979.

Mathematical Knowledge and Skills presents the achievement of 9-, 13-, and 17-year-olds during the school year 1977-78 as shown in the NAEP survey. Results and sample items, are presented for knowledge in numbers and numeration, geometry, and measurement; for computational skills with whole numbers, fractions, decimals, integers, percents and fractional conversions; for skills in measurement, reading graphs and tables, geometric and algebraic manipulations, and estimating. Some groups and age-level comparisons are made and as observations and recommendations.

National Assessment of Educational Progress. *Three national assessments of science: Changes in achievement, 1969-77.* (National Center for Education Statistics, Report No. 08-S-00). Denver, Colorado: 1978.

Three National Assessments of Science: Changes in Achievement, 1969-77 is a study of the changes in the three national science assessments: 1969-70, 1972-73, and 1976-77. In each assessment, students were assessed for achievement in three broad objectives of science education: (1) fundamental aspects of science; (2) applications of fundamentals to a wide range of problem situations; and (3) appreciation of the processes of science, its consequences and limitations, and the personal and social relevance of science to society. The second and third assessments contained questions from the first assessment so that comparisons could be made.

National Science Foundation. *Characteristics of doctoral scientists and engineers in the United States, 1973. Detailed statistical tables, appendix B,* NSF 75-312-A. Washington, D.C.: National Science Foundation, 1973.

Characteristics of Doctoral Scientists and Engineers in the United States, 1973. Detailed Statistical Tables, Appendix B, presents demographic and employment tables of data resulting from the 1973 Survey of Doctoral Scientists and Engineers conducted by the National Academy of Science for the NSF and the National Institutes of Health. Results of the survey are discussed in *Characteristics of Doctoral Scientists and Engineers in the United States, 1973* (NSF 75-312).

National Science Foundation. *Characteristics of doctoral scientists and engineers in the United States: 1977. Technical notes and detailed statistical tables,* NSF 79-306. Washington, D.C.: National Science Foundation, 1977.

Characteristics of Doctoral Scientists and Engineers in the United States: 1977 is a set of tables affording data on the demographic and employment characteristics of doctoral scientists and engineers (individuals holding S/E doctorates or holding non S/E doctorates but employed in S/E positions). Two previous surveys of this population were conducted in 1973 and 1975; some of the results from those surveys are presented here also for time-series information. Data include types of employer (education, business/industry, federal government), field, primary work activity, sex, age, race, years of experience, and other.

National Science Foundation. *Reviews of data on science resources.* June, 1978, NSF 78-310. Washington, D.C.: National Science Foundation, 1978.

Reviews of Data on Science Resources presents selected demographic and employment characteristics of recent bachelor's- and master's-degree recipients in science and engineering. The report presents findings of a 1976 survey of the 1973-74 and 1974-75 graduating classes. Eight pages of charts and text are accompanied by two detailed statistical tables showing by field and sex the total number of graduates, the number in the labor force, the number employed, the number employed in science and engineering, and the number in the field of training.

National Science Foundation. *Science resources studies highlights.* September 26, 1977, NSF 77-318. Washington, D.C.: National Science Foundation, 1977.

Science Resources Studies Highlights presents in this issue a summary of a report by Dr. Robert Boldt of Educational Testing Service on the Graduate Record Exam (GRE) scores over several years. The report, *Trends in Aptitudes of Graduate Students in Science,* is a statistical analysis of scores from 1970 to 1975 with particular emphasis on prospective science and engineering graduate students.

National Science Foundation. *Science resources studies highlights.* October 4, 1978, NSF 78-316, Washington, D.C.: National Science Foundation, 1978.

Science Resources Studies Highlights presents in this issue the first analytical results of the 1977 survey of doctoral scientists and engineers (earlier surveys were in 1973 and 1975). Tables, charts and text deal with employment data by type of employer, type of work activity, sex and field of employee, in both 1973 and 1977.

Pepin, Andrew J. *Fall enrollment in higher education 1978*, (to be published by National Center for Education Statistics, DHEW, Washington, D.C.).

Fall Enrollments in Higher Education 1978 was not published at the time the *Science Education Databook* was compiled but two tables from it were used in the *Data Book:* Table 26 — Total Enrollment in Institutions of Higher Education by Major Degree Field and Sex and By Control and Level of Institution; and Table 29 — Total Enrollment in Institutions of Higher Education, by Level of Enrollment, Sex and Attendance Status of Student and By Major Degree Field and Ethnicity: Aggregate United States, Fall 1978.

Pepin, Andrew J. *Fall enrollment in higher education 1976*. (National Center for Education Statistics: Stock Number 017-080-01907-8). Washington, D.C.: U.S. Government Printing Office, 1978.

Fall Enrollment in Higher Education 1976 is the result of a single effort of the National Center for Education Statistics and the Office of Civil Rights of the Department of Health, Education, and Welfare to conduct a single fall enrollment survey that would satisfy the needs of both agencies. Data in this publication are organized under six major categories: (a) enrollment by level of instituion; (b) enrollment by state; (c) enrollment by institution; (d) Enrollment by race/ethnicity; (e) enrollment by major degree field; and (f) Enrollment by major degree field and race/ethnicity.

Phi Delta Kappa, Inc., The eleventh annual Gallup poll of the public's attitude toward the public schools. *Phi Delta Kappan*, September 1979.

The Annual Gallup Poll of the Public's Attitude Toward the Public Schools surveys a replicated probability sample of American adults to determine attitudes toward such matters as school quality, problems, strengths, finances, quality compared with previous eras, and other topics. The poll is published each September in the *Phi Delta Kappan*. It provides information useful to school decision makers and others interested in the forces that shape and support the public school system.

Smith, Stanley V. and Wells, Agnes Q. *Earned degrees conferred, 1975-76*. (National Center for Education Statistics, Stock No. 017-080-01868-3). Washington, D.C.: U.S. Government Printing Office, 1978.

Higher Education, Earned Degrees Conferred, 1975-76, Summary Data is the fifth report in a series begun in 1970-71 to portray all degrees granted by all institutions in the United States identified as degree granting by the *Education Directory, Higher Education*. Detailed tables are provided in which bachelor's, master's, and doctor's degrees are categorized by level of degree, sex of student, control (public or private) of institution, and discipline specialty. All data collected for survey years 1970-71 through 1975-76 are directly comparable and provide excellent data for serial and trend analyses.

U.S. Dept. of Commerce, Bureau of the Census. *Current population reports, Series P-20, No. 336*, Washington, D.C.: 1979.

Current Population Reports, Population Profile of the United States: 1978 reports on a sample survey conducted on 60,000 households. Data are considered supplementary to that of the decennial census and not strictly comparable.

U.S., Dept. of Commerce, Bureau of the Census. *1970 census of population, Vol. I, U.S. Summary*, Washington, D.C.: 1975

1970 Census of Population, Vol. I, U.S. Summary provides data on the various racial groups in the U.S., as well as other information.

Vetter, Betty M., Babco, Eleanor L., McIntire, Judith E. *Professional women and minorities: A manpower data resource service, 2nd edition*. Washington, D.C.: Scientific Manpower Commission, November 1978.

Professional Women and Minorities: A Manpower Data Resource Service is designed to provide current and historical statistics about the professional segment of the U.S. population and particularly about the participation and availability of women and minorities in pursuits requiring at least the baccalaureate level. The first five sections of the volume deal with general enrollments, general degrees, general professions, general workforce and academic workforce. The remaining sections are devoted to subject fields (chemistry, mathematical sciences, life sciences, etc.) and provide data on degrees, enrollments, general workforce, and academic workforce.

Vetter, Betty M., *Labor force participation of women trained in science and engineering and factors affecting their participation.* Unpublished report submitted to National Science Foundation under Grant No. SRS 77-19575, by Scientific Manpower Commission, Washington, D.C., June 1979.

Labor Force Participation of Women Trained in Science and Engineering and Factors Affecting Their Participation presents data on science and engineering graduates of the past 15 years regarding: employment status, salaries, number and ages of children, fields of training and work, marital status, spouses, occupations, level of degrees, etc. Thirty-seven tables are accompanied by six pages of findings and detailed discussion.

Weiss, Iris R. *Report of the 1977 national survey of science, mathematics, and social studies education.* (National Science Foundation, SE-78-72). Washington, D.C.: U.S. Government Printing Office, 1978.

Report of the 1977 National Survey of Science, Mathematics, and Social Studies Education describes the results of a national survey designed to ascertain what science courses are offered in the schools, what textbooks and materials are being used in the schools, by grade level, how much time is being spent on the teaching of science, and what are the roles of science teachers, supervisors, and administrators in working in science education. The report provides excellent base line data for comparisons with future investigations. Data were gathered from teachers (both elementary and secondary), principals, superintendents, district supervisors, and state supervisors.

Weiss, Iris, R., Stake, Robert, Easley, Jack, Helgeson, Stanley L., Suydam, Marilyn N., Blosser, Patricia E., Osborne, Alan, Wiley, Karen B., & Race, Jeanne. *The status of pre-college science, mathematics, and social studies educational practices in U.S. schools: An overview and summaries of three studies* (National Science Foundation, SE-78-71). Washington, D.C.: U.S. Government Printing Office, 1978.

The Status of Pre-College Science, Mathematics, and Social Studies Educational Practices in U.S. Schools: An Overview and Summaries of Three Studies is a summary of the three studies: (a) the 1977 National Survey of Science, Mathematics and Social Studies Education conducted by the Research Triangle Institute of North Carolina; (b) Case Studies in Science Education conducted by the Center for Instructional Research and Curriculum Evaluation of the University of Illinois; and (c) The Status of Pre-College Science, Mathematics, and Social Science Education: 1955-75 (A Literature Review) conducted by the Center for Science and Mathematics Education, The Ohio State University. These studies were designed to assess the current status of pre-college science education in the United States.

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